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Science·fiction

APRIL 1945

25 CENTS

DEAD HAND

A FOUNDATION STORY
BY ISAAC ASIMOV

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WAR FUND

GIVE

Get after that cold in the 1st round

Gargle
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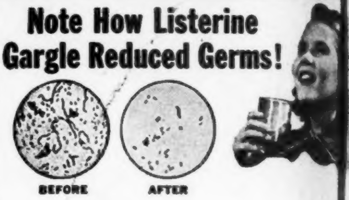

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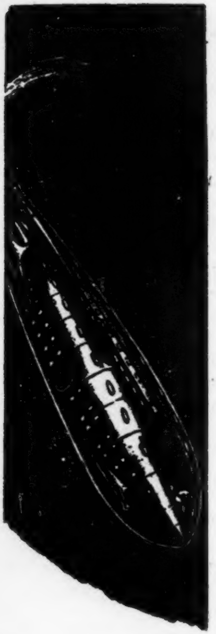

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Limits

ANTHROPOLOGISTS have a very hard time determining how long man—man of the type now currently known as homo sapiens by a normally highly conceited race——has been on this planet. The only reliable clock that can be used for measuring long periods of time happens to be the radium-uranium-lead-helium clock. That's an excellent timekeeper, in that neither heat nor cold, nor dark of night, nor anything else man's been able to stir up in the way of hellishness so far, with the single exception of atomic bombardment, alters the clock's rate. But, excellent as it is for periods of one hundred million years or so, it's as handy as a twenty-four-hour clock at a 100-yard dash when it comes to measuring the duration of man's existence on Earth. About all the anthropologists seem to be able to agree on is "more than one hundred thousand years, but not much more than two hundred fifty thousand."

Written history goes back only some six thousand years. The other ninety-four thousand to two hundred forty-four thousand years man—*modern type man*—spent learning three things: (A) to make fire, (B) to domesticate animals and (C) to plant grain seeds for food.

The average rate of invention was approximately thirty-three thousand to seventy-five thousand years per invention. In the next five thousand years, man made several dozen major inventions. In the next five hundred, he made several score. In the last fifty, man has made more fundamental inventions than in the total record of past history. The curve of man's progress in making natural law serve him is a high-order exponential type.

The problem's not new in science-fiction—that science and technology reach a stage which makes it impossible for a man in one lifetime to learn enough to be able to advance any further. Remember that homo sapiens has been around from one hundred to two hundred fifty kiloyears. He's almost certainly good for about an equal period in the future.

A couple of centuries ago, a student interested in mathematics could go to one great university, noted for its advanced work and teaching in the complex mathematics of addition, then to another great university where the mathematical department was noted for its courses in multiplication and division. Naturally, only scholars could afford the years of study required for ready handling of such advanced subjects, such difficult problems, as dividing 239,768 by 237, for instance, or multiplying 1793 by 836.

Strange, isn't it, that in two centuries men have become so much more intelligent that even a high-grade moron of these times is expected to learn that much.

Or, perhaps—we know a little bit better how to teach that subject.

Is the science of nuclear physics anywhere near as difficult as the non-science of social conventions and taboos that every five-year-old is expected to know today? There's predictable rhyme and reason to nuclear physics. Chemistry's so predictable Mendeljeef was able to describe germanium accurately before the element was known. But a man who can predict what another human being will do under a given condition is an expert with a crystal ball—yet that we expect of children.

Suppose you'd started, at the age of six to eight, with a working understanding of nuclear physics—as you did, at that age, understand social behavior? Do you think you might, by this time, be able to handle a bit more complex technology than we of today do?

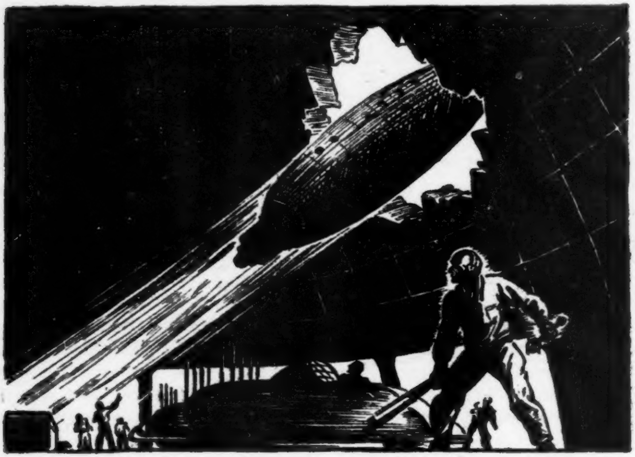
THE EDITOR.

Dead Hand

by ISAAC ASIMOV

The Foundation had always been weak—but heretofore the sharp wits of its leaders had protected it. But this time—Foundation's leaders were stupid men, and a clever general, under a strong Emperor was attacking.

Illustrated by Orban



I.

Four centuries of internal wrenchings subsided into another faint interval of quiet and order, that was half-exhausting, and for twenty-five years under Cleon II the Galactic Empire experienced the milky feeble gleam of a last Indian Summer.

Bel Riose traveled without escort, which is not what court etiquette prescribes for the head of a fleet stationed in a yet-sullen stellar system on the Marches of the Galactic Empire.

But Bel Riose was young and energetic—energetic enough to be sent as near the end of the universe as possible by an unemotional and calculating court—and curious besides. Strange and improbable tales fancifully-repeated by hundreds and murkily-known to thousands intrigued the last faculty; the possibility of a military venture engaged the other two. The combination was overpowering.

He was out of the dowdy groundcar he had appropriated and at the door of the fading mansion that was his destination. He waited. The photonic eye that spanned the doorway was alive, but when the door opened it was by hand.

Bel Riose smiled at the old man. "I am Riose—"

"I recognize you." The old man remained stiffly and unsurprised in his place. "Your business?"

Riose withdrew a step in a gesture of submission. "One of peace. If you are Ducem Barr, I ask the favor of conversation."

Ducem Barr stepped aside and in the interior of the house, the walls glowed into life. The general entered into daylight.

He touched the wall of the study, then stared at his fingertips. "You have this on Siwenna?"

Barr smiled thinly. "Not elsewhere, I believe. I keep this in repair myself as well as I can. I must apologize for your wait at the door. The automatic device registers the presence of a visitor but will no longer open the door."

"Your repairs fall short?" The general's voice was faintly mocking.

"Parts are no longer available. If you will sit, sir. You drink tea?"

"On Siwenna? My good sir, it is socially impossible not to drink it here."

The old patrician retreated noiselessly with the slow bow that was part of the ceremonious legacy left by a *ci-devant* aristocracy of the last century's better days.

Riose looked after his host's departing figure, and his studied urbanity grew a bit uncertain at the edges. His education had been purely military; his experience, likewise. He had, as the cliche has it, faced death many times; but always death of a very familiar and tangible nature. Consequently, there is no inconsistency in the fact that the idolized lion of the Twentieth Fleet felt chilled in the suddenly musty atmosphere of an ancient room.

The general recognized the small black-ivroid boxes that lined the shelves to be books. Their titles were unfamiliar. He guessed that the large structure at one end of the room was the receiver that transmuted the books into sight-and-sound on demand. He had never seen one in operation; but he had heard of them.

Once he had been told that long before, during the golden ages when the Empire had been co-extensive with the entire Galaxy, nine houses out of every ten had such receivers—and such rows of books.

But there were borders to watch now; books were for old men. And half the stories told about the old days were mythical anyway. More than half.

The tea arrived, and Riose seated himself. Ducem Barr lifted his cup. "To your honor."

"Thank you. To yours."

Ducem Barr said deliberately, "You are said to be young. Thirty-five?"

"Near enough. Thirty-four."

"In that case," said Barr, with soft emphasis, "I could not begin better than by informing you regretfully that I am not in the possession of love charms, potions, or philtres. Nor am I in the least capable of influencing the favors of any young lady as may appeal to you."

"I have no need of artificial aids in that respect, sir." The complacency undeniably present in the general's voice was stirred with amusement. "Do you receive many requests for such commodities?"

"Enough. Unfortunately, an uninformed public tends to confuse scholarship with magicianry, and love life seems to be that factor which requires the largest quantity of magical tinkering."

"And so would seem most natural. But I differ. I connect scholarship with nothing but the means of answering difficult questions."

The Siwennian considered somberly. "You may be as wrong as they!"

"That may turn out or not." The young general set down his cup in its flaring sheath and it refilled. He dropped the offered flavor-capsule into it with a small splash. "Tell me then, patrician, who are the magicians? The real ones."

Barr seemed startled at a title long-unused. He said, "There are no magicians."

"But people speak of them. Siwenna crawls with the tales of them. There are cults being built about them. There is some strange connection between it and those groups among your countrymen who dream and drivel of ancient days and what they call liberty and autonomy. Eventually the matter might become a danger to the State."

The old man shook his head. "Why ask me? Do you smell rebellion, with myself at the head?"

Riose shrugged, "Never. Never. Oh, it is not a thought completely ridiculous. Your father was an exile in his day; you yourself a patriot and a chauvinist in yours. It is indelicate in me as a guest to mention it, but my business here requires it. And yet a conspiracy now? I doubt it. Siwenna has had the spirit beat out of it these three generations."

The old man replied with difficulty, "I shall be as indelicate a host as you a guest. I shall remind you that once a viceroy thought as you did of the spiritless Siwennians. By the orders of that viceroy my father became a fugitive pauper, my brothers martyrs and my sister a suicide. Yet that viceroy died a death sufficiently horrible at the hands of these same slavish Siwennians."

"Ah, yes, and there you touch nearly on something I could wish to say. For three years the mysterious death of that viceroy has been no mystery to me. There was a young soldier of his personal guard whose actions were of interest. You were that soldier, but there is no need of details, I think."

Barr was quiet. "None. What do you propose?"

"That you answer my questions."

"Not under threats. I am old, but not yet so old that life means particularly overmuch."

"My good sir, these are hard times," said Riose, with meaning, "and you have children and friends. You have a country for which you have mouthed phrases of love and folly in the past. Come, if I should decide to use force, my aim would not be so poor as to strike you."

Barr said coldly, "What do you want?"

Riose held the empty cup as he spoke. "Patrician, listen to me. These are days when the most successful soldiers are those whose function is to lead the dress parades that wind through the imperial palace grounds on feast days and to escort the sparkling pleasure ships that carry His Imperial Splendor to the summer planets. I . . . I am a failure. I am a failure at thirty-four, and I shall stay a failure. Because, you see, I like to fight.

"That's why they sent me here. I'm too troublesome at court. I don't fit in with the etiquette. I offend the dandies and the lord admirals, but I'm too good a leader of ships and men to be disposed of shortly by being marooned in space. So Siwenna is the substitute. It's a frontier world; a rebellious and a barren province. It is far away; far enough away to satisfy all.

"And so I moulder. There are no rebellions to stamp down, and the border viceroys do not revolt lately; at least, not since His Imperial Majesty's late father of glorious memory made an example of Mountel of Paramay."

"A strong Emperor," muttered Barr.

"Yes, and we need more of them. He is my master; remember that. These are his interests I guard."

Barr shrugged unconcernedly. "How does all this relate to the subject?"

"I'll show you in two words. The magicians I've mentioned come from beyond—out there beyond the frontier guards, where the stars are scattered thinly—"

" 'Where the stars are scattered thinly,' " quoted Barr, " 'And the cold of space seeps in.' "

"Is that poetry?" Riose frowned. Verse seemed frivolous at the moment. "In any case, they're from the Periphery—from the only quarter where I am free to fight for the glory of the emperor."

"And thus serve His Imperial Majesty's interests and satisfy your own love of a good fight."

"Exactly. But I must know what I fight; and there you can help."

"How do you know?"

Riose nibbled casually at a cakelet. "Because for three years I have traced every rumor, every myth, every breath concerning the magicians—and of all the library

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of information I have gathered, only two isolated facts are unanimously agreed upon, and are hence certainly true. The first is that the magicians come from the edge of the Galaxy opposite Siwenna; the second is that your father once met a magician, alive and actual, and spoke with him."

The aged Siwennian stared unblinkingly, and Riose continued, "You had better tell me what you know—"

Barr said thoughtfully, "It would be interesting to tell you certain things. It would be a psycho-historic experiment of my own."

"What kind of experiment?"

"Psycho-historic." The old man had an unpleasant edge to his smile. Then, crisply, "You'd better have more tea. I'm going to make a bit of a speech."

He leaned far back into the soft cushions of his chair. The wall-lights had softened to a pink-ivory glow, which mellowed even the soldier's hard profile.

Ducem Barr began, "My own knowledge is the result of two accidents; the accidents of being born the son of my father, and of being born the native of my country. It begins over forty years ago, shortly after the great Massacre, when my father was a fugitive in the forests of the South, while I was a gunner in the viceroy's personal fleet. This same viceroy, by the way, who had ordered the Massacre, and who died such a cruel death thereafter."

Barr smiled grimly, and continued, "My father was a Patrician of the Empire and a Senator of Siwenna. His name was Onum Barr."

Riose interrupted impatiently, "I know the circumstances of his exile very well. You needn't elaborate upon it."

The Siwennian ignored him and proceeded without deflection. "During his exile a wanderer came upon him; a merchant from the edge of the Galaxy; a young man who spoke a strange accent, knew nothing of recent Imperial history, and who was protected by an individual force-shield."

"An individual force-shield?" Riose glared. "You speak extravagance. What generator could be powerful enough to condense a shield to the size of a single man? By the Great Galaxy, did he carry five thousand myria-tons of atomic power-source about with him on a little wheeled gocart?"

Barr said quietly, "This is the magician of whom you hear whispers, stories and myths. The name 'magician' is not lightly earned. He carried no generator large enough to be seen, but not the heaviest weapon you can carry in your hand would have as much as creased the shield he bore."

"Is this all the story there is? Are the magicians born of maunderings of an old man broken by suffering and exile?"

"The story of the magicians antedated even my father, sir. And the proof is more concrete. After leaving my father, this merchant that men call a magician visited a

Tech-man at the city to which my father had guided him, and there he left a shield-generator of the type he wore. That generator was retrieved by my father after his return from exile upon the execution of the bloody viceroy. It took a long time to find—"

"The generator hangs on the wall behind you, sir. It does not work. It never worked but for the first two days; but if you'll look at it, you will see that no one in the Empire ever designed it."

Bel Riose reached for the belt of linked metal that clung to the curved wall. It came away with a little sucking noise as the tiny adhesion-field broke at the touch of his hand. The ellipsoid at the apex of the belt held his attention. It was the size of a walnut.

"This—" he said.

"Was the generator," nodded Barr. "But it *was* the generator. The secret of its workings are beyond discovery now. Sub-electronic investigations have shown it to be fused into a single lump of metal and not all the most careful study of the diffraction patterns have sufficed to distinguish the discrete parts that had existed before fusion."

"Then your 'proof' still lingers on the frothy border of words backed by no concrete evidence."

Barr shrugged. "You have demanded my knowledge of me and threatened its extortion by force. If you choose to meet it with skepticism, what is that to me? Do you want me to stop?"

"Go on!" said the general, harshly.

"I continued my father's researches after he died, and then the second accident I mentioned came to help me, for Siwenna was the native world of Hari Seldon."

"And who is Hari Seldon?"

"Hari Seldon was a scientist of the reign of the Emperor, Daluben IV. He was a psycho-historian; the last and greatest of them all. He was the pride of Siwenna, when Siwenna was a great commercial center, rich in the arts and sciences."

"Hmph," muttered Riose, sourly, "where is the stagnant planet that does not claim to have been a land of overflowing wealth in older days?"

"The days I speak of are the days of two centuries ago, when the Emperor yet ruled to the uttermost star; when Siwenna was a world of the interior and not a semi-barbarian border province. In those days, Hari Seldon foresaw the decline of Imperial power and the eventual barbarization of the entire Galaxy."

Riose laughed suddenly. "He foresaw that? Then he foresaw wrong, my good scientist. I suppose you call yourself that. Why, the Empire is more powerful now than it has been in a millennium. Your old eyes are blinded by the cold bleakness of the border. Come to the inner worlds some day; come to the warmth and the wealth of the center."

The old man shook his head somberly. "Circulation ceases first at

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the outer edges. It will take a while yet for the decay to reach the heart. That is, the apparent, obvious-to-all decay, as distinct from the inner decay that is an old story of some fifteen centuries."

"And so this Hari Seldon foresaw a Galaxy of uniform barbarism," said Riose, good-humoredly. "And what then, eh?"

"So he established two Foundations at the extreme opposing ends of the Galaxy—Foundations of the best, and the youngest, and the strongest, there to breed, grow, and develop. The worlds on which they were placed were chosen carefully; as were the times and the surroundings. All was arranged in such a way that the future as foreseen by the unalterable mathematics of psycho-history would involve their early isolation from the main body of Imperial civilization and their gradual growth into the germs of the Second Galactic Empire—cutting an inevitable barbarian interregnum from thirty thousand years to scarcely a single thousand."

"And where did you find out all this? You seem to know it in detail."

"I don't and never did," said the patrician with composure. "It is the painful result of the piecing together of certain evidence discovered by my father and a little more found by myself. The basis is flimsy and the superstructure has been romanticized into existence to fill the huge gaps. But I am convinced that it is essentially true."

"You are easily convinced."

"Am I? It has taken forty years of research."

"Hmph. Forty years! I could settle the question in forty days. In fact, I believe I ought to. It would be—different."

"And how would you do that?"

"In the obvious way. I could become an explorer. I could find this Foundation you speak of and observe with my eyes. You say there are two?"

"The records speak of two. Supporting evidence has been found only for one, which is understandable, for the other is at the extreme end of the long axis of the Galaxy."

"Well, we'll visit the near one." The general was on his feet, adjusting his belt.

"You know where to go?" asked Barr.

"In a way. In the records of the last viceroy but one, he whom you murdered so effectively, there are suspicious tales of outer barbarians. In fact, one of his daughters was given in marriage to a barbarian prince. I'll find my way."

He held out a hand. "I thank you for your hospitality."

Ducem Barr touched the hand with his fingers and bowed formally. "Your visit was a great honor."

"As for the information you gave me," continued Bel Riose, "I'll know how to thank you for that when I return."

Ducem Barr followed his guest submissively to the outer door and said quietly to the disappearing ground-car, "And *if* you return."

II.

Forty years of expansion had passed; and the Foundation had grown secure. The time of dangerous living was gone, and only a few of those with the most to lose wondered if it might return.

There were four men in the room, and the room was set apart where none could approach. The four men looked at each other quickly, then lengthily at the table that separated them. There were four bottles on the table and as many full glasses, but no one had touched them.

And then the man nearest the door stretched out an arm and drummed a slow, padding rhythm on the table.

He said, "Are you going to sit and wonder forever? Does it matter who speaks first?"

"Speak you first, then," said the big man directly opposite. "You're the one who should be the most worried."

Sennett Forell chuckled with noiseless nonhumor. "Because you think I'm the richest. Well— Or is it that you expect me to continue as I have started. I don't suppose you forget that it was my own Trade Fleet that captured this scout ship of theirs."

"You had the largest fleet," said a third, "and the best pilots; which is another way of saying you are the richest. It was a fearful risk; and would have been greater for one of us."

Sennett Forell chuckled again. "There is a certain facility in risk-taking that I inherit from my father. After all, the essential point in running a risk is that the returns justify it. As to which, witness the fact that the enemy ship was isolated and captured without loss to ourselves or warning to the others."

That Forell was a distant collateral relative of the late great Hober Mallow was recognized openly throughout the Foundation. That he was Mallow's illegitimate son was accepted quietly to just as wide an extent.

The fourth man blinked his little eyes stealthily. Words crept out from between thin lips. "It is nothing to sleep over in fat triumph, this grasping of little ships. Most likely, it will but anger that young man further."

"You think he needs motives?" questioned Forell, scornfully.

"I do, and this might, or will, save him the vexation of having to manufacture one." The fourth man spoke slowly, "Hober Mallow worked otherwise. And Salvor Hardin. They let others take the uncertain paths of force, while they maneuvered surely and quietly."

Forell shrugged. "This ship has proved its value. Motives are cheap and we have sold this one at a profit." There was the satisfaction of the born Trader in that. He continued, "The young man is of the old Empire."

"We knew that," said the second man, the big one, with rumbling discontent.

"We suspected that," corrected

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Forell, softly. "If a man comes with ships and wealth, with overtures of friendliness, and with offers of trade, it is only sensible to refrain from antagonizing him, until we are certain that the profitable mask is not a face after all. But now—"

There was a faint whining edge to the third man's voice as he spoke. "We might have been even more careful. We might have found out first. We might have found out before allowing him to leave. It would have been the truest wisdom."

"That has been discussed and disposed of," said Forell. He waved the subject aside with a flatly final gesture.

"The government is soft," complained the third man. "The mayor is an idiot."

The fourth man looked at the other three in turn and removed the stub of a cigar from his mouth. He dropped it casually into the slot at his right where it disappeared with a silent flash of disruption.

He said sarcastically, "I trust the gentleman who last spoke is speaking through habit only. We can afford to remember here that *we* are the government."

There was a murmur of agreement.

The fourth man's little eyes were on the table. "Then let us leave government policy alone. This young man . . . this stranger might have been a possible customer. There have been cases. All three of you tried to butter him into an advance contract. We have an agreement—a gentleman's agreement—against it, but you tried."

"So did you," growled the second man.

"I know it," said the fourth, calmly.

"Then let's forget what we should have done earlier," interrupted Forell impatiently, "and continue with what we should do now. In any case, what if we had imprisoned him, or killed him, what then? We are not certain of his intentions even yet, and at the worst, we could not destroy an Empire by snipping short one man's life. There might be navies upon navies waiting just the other side of his nonreturn."

"Exactly," approved the fourth man. "Now what did you get out of your captured ship? I'm too old for all this talking."

"It can be told in few enough words," said Forell, grimly. "He's an Imperial general or whatever rank corresponds to that over there. He's a young man who has proved his military brilliance—so I am told—and who is the idol of his men. Quite a romantic career. The stories they tell of him are no doubt half lies, but even so it makes him out to be a type of wonder man."

"Who are the 'they'?" demanded the second man.

"The crew of the captured ship. Look, I have all their statements recorded on micro-film, which I have in a secure place. Later on, if you wish, you can see them. You can talk to the men yourselves, if you think it necessary. I've told you the essentials."

"How did you get it out of them? How do you know they're telling the truth?"

Forell frowned. "I wasn't gentle, good sir. I knocked them about, drugged them crazy, and used the Probe unmercifully. They talked. You can believe them."

"In the old days," said the third man, with sudden irrelevance, "they would have used pure psychology. Painless, you know, but very sure. No chance of deceit."

"Well, there is a good deal they had in the old days," said Forell, dryly. "These are the new days."

"But," said the fourth man, "what did he want here, this general, this romantic wonder-man?" There was a dogged, weary persistence about him.

Forell glanced at him sharply. "You think he confides the details of state policy to his crew. They didn't know. There was nothing to get out of them in that respect, and I tried, Galaxy knows."

"Which leaves us—"

"To draw our own conclusions, obviously." Forell's fingers were tapping quietly again. "The young man is a military leader of the Empire, yet he played the pretense of being a minor princeling of some scattered stars in an odd corner of the Periphery. That alone would assure us that his real motives are such as it would not benefit him to have us know. Combine the nature of his profession with the fact that the Empire has already subsidized one attack upon us in my father's time, and the possibilities become ominous. That first attack failed. I doubt that the Empire owes us love for that."

"There is nothing in your findings," questioned the fourth man guardedly, "which makes for certainty? You are withholding nothing?"

Forell answered levelly, "I can't withhold anything. From here on there can be no question of business rivalry. Unity is forced upon us."

"Patriotism?" There was a sneer in the third man's thin voice.

"Patriotism be damned," said Forell quietly. "Do you think I give two puffs of atomic emanation for the future Second Empire? Do you think I'd risk a single Trade mission to smooth its path? But—do you suppose Imperial conquest will help my business or yours? If the Empire wins, there will be a sufficient number of yearning carrion crows to crave the rewards of battle."

"And we're the rewards," added the fourth man, dryly.

The second man broke his silence suddenly, and shifted his bulk angrily, so that the chair creaked under him. "But why talk of that. The Empire can't win, can it? There is Seldon's assurance that we will form the Second Empire in the end. This is only another crisis. There have been three before this."

"Only another crisis, yes!" Forell brooded. "But in the case of the first two, we had Salvor Hardin to guide us; in the third, there was

Hober Mallow. Whom have we now?"

He looked at the others somberly and continued, "Seldon's rules of psycho-history on which it is so comforting to rely, probably have as one of the contributing variables, a certain normal initiative on the part of the people of the Foundation themselves. Seldon's laws help those who help themselves."

"The times make the man," said the third man. "There's another proverb for you."

"You can't count on that, not with absolute assurance," grunted Forell. "Now the way it seems to me is this. If this is the fourth crisis, then Seldon has foreseen it. If he has, then it can be beaten, and there should be a way of doing it.

"Now the Empire is stronger than we; it always has been. But this is the first time we are in danger of its direct attack, so that strength becomes terribly menacing. Then if it can be beaten, it must be once again as in all past crises, by a method other than pure force. We must find the weak side of its enemy and attack it there."

"And what is that weak side?" asked the fourth man. "Do you intend advancing a theory?"

"No. That is the point I'm leading up to. Our great leaders of the past always saw the weak points of their enemies and aimed at that. But now—"

There was a helplessness in his voice, and for a moment none volunteered a comment.

Then the fourth man said, "We need spies."

Forell turned to him eagerly. "Right! I don't know when the Empire will attack. There may be time."

"Hober Mallow himself entered the Imperial dominions," suggested the second man.

But Forell shook his head. "Nothing so direct. None of us are precisely youthful; and all of us are rusty with red-tape and administrative detail. We need young men that are in the field now—"

"The independent traders?" asked the fourth man.

And Forell nodded his head and whispered, "If there is yet time—"

III.

Bel Riose interrupted his annoyed stridings to look up hopefully when his aide entered. "Any word of the *Starlet*?"

"None. The scouting party has quartered space, but the instruments have detected nothing. Commander Yume has reported that the Fleet is ready for an immediate attack in retaliation."

The general shook his head. "No, not for a patrol ship. Not yet. Tell him to double— Wait! I'll write out the message. Have it coded and transmitted by tight beam."

He wrote as he talked and thrust the paper at the waiting officer. "Has the Siwennian arrived yet?"

"Not yet."

"Well, see to it that he is brought

in here as soon as he does arrive."

The aide saluted crisply and left. Riose resumed his caged stride.

When the door opened a second time, it was Ducem Barr that stood on the threshold. Slowly, in the footsteps of the ushering aide, he stepped into the garish room whose ceiling was an ornamented stereoscopic model of the Galaxy, and in the center of which Bel Riose stood in field uniform.

"Patrician, good day!" The general pushed forward a chair with his foot and gestured the aide away with a "That door is to stay closed till I open it."

He stood before the Siwennian, legs apart, hand grasping wrist behind his back, balancing himself slowly, thoughtfully, on the balls of his feet.

Then, harshly, "Patrician, are you a loyal subject of the Emperor?"

Barr, who had maintained an indifferent silence till then, wrinkled a noncommittal brow. "I have no cause to love Imperial rule."

"Which is a long way from saying that you would be a traitor."

"True. But the mere act of not being a traitor is also a long way from agreeing to be an active helper."

"Ordinarily also true. But to refuse your help at this point," said Riose, deliberately, "will be considered treason and treated as such."

Barr's eyebrows drew together. "Save your verbal cudgels for your subordinates. A simple statement of your needs and wants will suffice me here."

Riose sat down and crossed his legs. "Barr, we had an earlier discussion half a year ago."

"About your magicians?"

"Yes. You remember what I said I would do."

Barr nodded. His arms rested limply in his lap. "You were going to visit them in their haunts, and you've been away these four months. Did you find them?"

"Find them? That I did," cried Riose. His lips were stiff as he spoke. It seemed to require effort to refrain from grinding molars. "Patrician, they are not magicians; they are devils. It is as far from belief as the outer nebulae from here. Conceive it! It is a world the size of a handkerchief, of a fingernail; with resources so petty, power so minute, a population so microscopic as would never suffice the most backward worlds of the dusty prefects of the Dark Stars. Yet with that, a people so proud and ambitious as to dream quietly and methodically of Galactic rule.

"Why, they are so sure of themselves that they do not even hurry. They move slowly, phlegmatically; they speak of necessary centuries. They swallow worlds at leisure; creep through systems with dawdling complacence.

"And they succeed. There is no one to stop them. They have built up a filthy trading community that curls its tentacles about systems further than their toy ships dare reach. For parsecs, their Traders—which is what their agents call themselves—penetrate."

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Ducem Barr interrupted the angry flow. "How much of this information is definite; and how much is simply fury?"

The soldier caught his breath and grew calmer. "My fury does not blind me. I tell you I was in worlds nearer to Siwenna than to the Foundation, where the Empire was a myth of the distance, and where Traders were living truths. We ourselves were mistaken for Traders."

"The Foundation itself told you they aimed at Galactic dominion?"

"Told me!" Riose was violent again. "It was not a matter of telling me. The officials said nothing. They spoke business exclusively. But I spoke to ordinary men. I absorbed the ideas of the common folk; their 'manifest destiny,' their calm acceptance of a great future. It is a thing that can't be hidden; a universal optimism they don't even try to hide."

The Siwennian openly displayed a certain quiet satisfaction. "You will notice that so far it would seem to bear out quite accurately my reconstruction of events from the paltry data on the subject that I have gathered."

"It is no doubt," replied Riose with vexed sarcasm, "a tribute to your analytical powers. It is also a hearty and bumptious commentary on the growing danger to the domains of His Imperial Majesty."

Barr shrugged his unconcern, and Riose leaned forward suddenly, to seize the old man's shoulders and stare with curious gentleness into his eyes.

He said, "Now, patrician, none of that. I have no desire to be barbaric. For my part, the legacy of Siwennian hostility to the Imperium is an odious burden, and one which I would do everything in my power to wipe out. But my province is the military and interference in civil affairs is impossible. It would bring about my recall and ruin my usefulness at once. You see that? I know you see that. Between yourself and myself then, let the atrocity of forty years ago be repaid by your vengeance upon its author and so forgotten. I need your help. I frankly admit it."

There was a world of urgency in the young man's voice, but Ducem Barr's head shook gently and deliberately in a negative gesture.

Riose said pleadingly, "You don't understand, patrician, and I doubt my ability to make you. I can't argue on your ground. You're the scholar, not I. But this I can tell you. Whatever you think of the Empire, you will admit its great services. Its armed forces have committed isolated crimes, but in the main they have been a force for peace and civilization. It was the Imperial navy that created the *Pax Imperium* that ruled over all the Galaxy for two thousand years. Contrast the two millennia of peace under the Sun-and-Spaceship of the Empire with the two millennia of interstellar anarchy that preceded it. Consider the wars and devastations of those old days and tell me if, with all its faults, the Empire is not worth preserving.

"Consider," he drove on forcefully, "to what the outer fringe of the Galaxy is reduced in these days of their break-away and independence, and ask yourself if for the sake of a petty revenge you would reduce Siwenna from its position as a province under the protection of a mighty Navy to a barbarian world in a barbarian Galaxy, all immersed in its fragmentary independence and its common degradation and misery."

"Is it so bad—so soon?" murmured the Siwennian.

"No," admitted Riose. "We would be safe ourselves no doubt, were our lifetimes quadrupled. But it is for the Empire I fight; that, and a military tradition which is something for myself alone, and which I cannot transfer to you. It is a military tradition built on the Imperial institution which I serve."

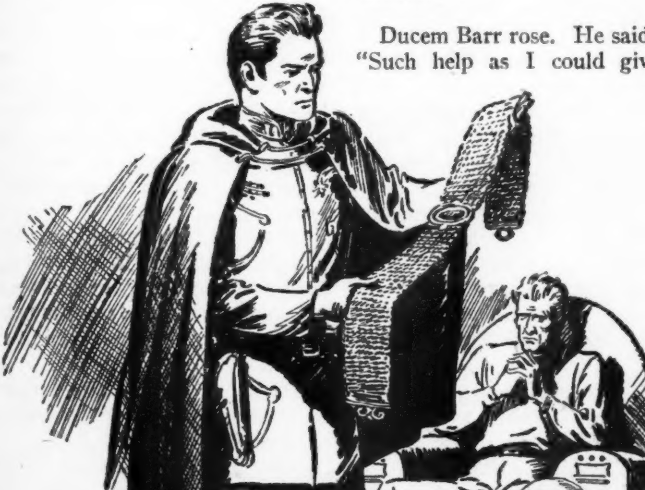
"You are getting mystical, and I always find it difficult to penetrate another person's mysticism."

"No matter. You understand the danger of this Foundation."

"It was I who pointed out what you call the danger before ever you headed outward from Siwenna."

"Then you realize that it must be stopped in embryo or perhaps not at all. You have known of this Foundation before anyone had heard of it, You know more about it than anyone else in the Empire. You probably know how it might best be attacked; and you can probably forewarn me of its countermeasures. Come, let us be friends."

Ducem Barr rose. He said flatly, "Such help as I could give you



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means nothing. So I will make you free of it in the face of your strenuous demand."

"I will be the judge of its meaning."

"No, I am serious. Not all the might of the Empire could avail to crush this pygmy world."

"Why not?" Bel Riose's eyes glistened fiercely. "No, stay where you are. I'll tell you when you may leave. Why not? If you think I underestimate this enemy I have discovered, you are wrong. Patrician," he spoke reluctantly, "I lost a ship on my return. I have no proof that it fell into the hands of the Foundation; but it has not been located since and were it merely an accident, its dead hulk should certainly have been found along the route we took. It is not an important loss—less than the tenth part of a fleabite, but it may mean that the Foundation has already opened hostilities. Such eagerness and such disregard for consequences might mean secret forces of which I know nothing. Can you help me then by answering a specific question? What is their military power?"

"I haven't any notion."

"Then explain yourself on your own terms. Why do you say the Empire cannot defeat this small enemy?"

The Siwennian seated himself once more and looked away from Riose's fixed glare. He spoke heavily, "Because I have faith in the principles of psycho-history. It is a strange science. It reached mathematical maturity with one man, Hari Seldon, and died with him, for no man since has been capable of manipulating its intricacies. But in that short period, it proved itself the most powerful instrument ever invented for the study of humanity. Without pretending to predict the actions of individual humans, it formulated definite laws capable of mathematical analysis and extrapolation to govern and predict the mass action of human groups."

"So—"

"It was that psycho-history which Seldon and the group he worked with applied in full force to the establishment of the Foundation. The place, time, and conditions all conspire mathematically and so, inevitably, to the development of Universal Empire."

Riose's voice trembled with indignation. "You mean that this art of his predicts that I would attack the Foundation and lose such and such a battle for such and such a reason? You are trying to say that I am a silly robot following a pre-determined course into destruction."

"No," replied the old patrician, sharply. "I have already said that the science had nothing to do with individual actions. It is the vaster background that has been foreseen."

"Then we stand clasped tightly in the forcing hand of the Goddess of Historical Necessity."

"Of *Psycho*-Historical Necessity," prompted Barr, softly.

"And if I exercise my prerogative of freewill? If I choose to attack next year, or not to attack at all? How pliable is the Goddess? How resourceful?"

Barr shrugged. "Attack now or never; with a single ship, or all the force in the Empire; by military force or economic pressure; by candid declaration of war or by treacherous ambush. Do whatever you wish in your fullest exercise of freewill. You will still lose."

"Because of Hari Seldon's dead hand?"

"Because of the dead hand of the mathematics of human behavior that can neither be stopped, swerved, nor delayed."

The two faced each other in deadlock, until the general stepped back.

He said simply, "I'll take that challenge. It's a dead hand against a living will."

IV.

Cleon II was Lord of the Universe. Cleon II also suffered from a painful and undiagnosed ailment. By the queer twists of human affairs, the two statements are not mutually exclusive, nor even particularly incongruous. There have been a wearisomely large number of precedents in history.

But Cleon II cared nothing for such precedents. To meditate upon a long list of similar cases would not ameliorate personal suffering an electron's worth. It soothed him as little to think that where his great-grandfather had been the pirate ruler of a dust-speck planet, he himself slept in the pleasure palace of Ammenetik the Great, as heir of a line of Galactic rulers stretching backward into a tenuous past. It was at present no source of comfort to him that the efforts of his father had cleansed the realm of its leprous patches of rebellion and restored it to the peace and unity it had enjoyed under Stanel VI; that, as a consequence, in the twenty-five years of his reign, not one cloud of revolt had misted his burnished glory.

The Emperor of the Galaxy and the Lord of All whimpered as he lolled his head backward into the invigorating plane of force about his pillows. It yielded in a softness that did not touch, and at the pleasant tingle, Cleon relaxed a bit. He sat up with difficulty and stared morosely at the distant walls of the grand chamber. It was a bad room to be alone in. It was too big. All the rooms were too big.

But better to be alone during these crippling bouts than to endure the prinking of the courtiers, their lavish sympathy, their soft, condescending dullness. Better to be alone than to watch those insipid masks behind which spun the tortuous speculations on the chances of death and the fortunes of the succession.

His thoughts hurried him. There were his three sons; three straight-backed youths full of promise and virtue. Where did they disappear on these bad days? Waiting, no doubt. Each watching the other; and all watching him.

He stirred uneasily. And now Brodrig craved audience. The low-born, faithful Brodrig; faithful because he was hated with a unanimous and cordial hatred that was the only point of agreement between the dozen cliques that divided his court.

Brodrig—the faithful favorite, who had to be faithful, since unless he owned the fastest speed-ship in the Galaxy and took to it the day of the Emperor's death, it would be the atom-chamber the day after.

Cleon II touched the smooth knob on the arm of his great divan, and the huge door at the end of the room dissolved to transparency.

Brodrig advanced along the crimson carpet, and knelt to kiss the Emperor's limp hand.

"Your health, sire?" asked the Privy Secretary in a low tone of becoming anxiety.

"I live," snapped the Emperor with exasperation, "if you can call it life where every scoundrel who can read a book of medicine uses me as a blank and receptive field for his feeble experiments. If there is a conceivable remedy; chemical, physical, or atomic, which has not yet been tried; why then, some learned babbler from the far corners of the realm will arrive tomorrow to try it. And still another newly-discovered book, or forgery more-like, will be used as authority.

"By my father's memory," he rumbled savagely, "it seems there is not a biped extant who can study a disease before his eyes with those same eyes. There is not one who can count a pulse-beat without a book of the ancients before him. I'm sick and they call it 'unknown.' The fools! If in the course of millennia, human bodies learn new methods of falling askew, it remains uncovered by the studies of the ancients and uncurable forevermore. The ancients should be alive now, or I then."

The Emperor ran down to a low-breathed curse while Brodrig waited dutifully. Cleon II said peevishly, "How many are waiting outside?"

He jerked his head in the direction of the door.

Brodrig said patiently, "The Great Hall holds the usual number."

"Well, let them. State matters occupy me. Have the Captain of the Guard announce it. Or wait, forget the state matters. Just have it announced I hold no audience, and let the Captain of the Guard look doleful. The jackals among them may betray themselves." The Emperor sneered nastily.

"There is a rumor, sire," said Brodrig, smoothly, "that it is your heart that troubles you."

The Emperor's smile was little removed from the previous sneer. "It will hurt others more than myself if any act prematurely on that rumor. But what is it *you* want. Let's have this over."

Brodrig rose from his kneeling posture at a gesture of permission and said, "It concerns General Bel Riose, the Military Governor of Siwenna."

"Riose?" Cleon II frowned heavily. "I don't place him. Wait, is he the one who sent that quixotic message some months back? Yes, I remember. He panted for permission to enter a career of conquest for the glory of the Empire and Emperor."

"Exactly, sire."

The Emperor laughed shortly. "Did you think I had such generals left me, Brodrig? He seems to be a curious atavism. What was the answer? I believe you took care of it."

"I did, sire. He was instructed to forward additional information and to take no steps involving naval action without further orders from the Imperium."

"Hmp. Safe enough. Who is this Riose. Was he ever at court?"

Brodrig nodded and his mouth twisted ever so little. "He began his career as a cadet in the Guards ten years back. He had part in that affair off the Lemul Cluster."

"The Lemul Cluster? You know, my memory isn't quite— Was that the time a young soldier saved two ships of the line from a head-on collision by . . . uh . . . something or other?" He waved a hand impatiently. "I don't remember the details. It was something heroic."

"Riose was that soldier. He received a promotion for it," Brodrig said dryly, "and an appointment to field duty as captain of a ship."

"And now Military Governor of a border system and still young. Capable man, Brodrig!"

"Unsafe, sire. He lives in the past. He is a dreamer of ancient times, or rather, of the myths of what ancient times used to be. Such men are harmless in themselves, but their queer lack of realism makes them fools for others." He added, "His men, I understand, are completely under his control. He is one of your *popular* generals."

"Is he?" the Emperor mused. "Well, come, Brodrig, I would not wish to be served entirely by incompetents. They certainly set no enviable standard for faithfulness themselves."

"An incompetent traitor is no danger. It is rather the capable men who must be watched."

"You among them, Brodrig?" Cleon II laughed and then grimaced with pain. "Well, then, you may forget the lecture for the while. What new development is there in the matter of this young conqueror? I hope you haven't come merely to reminisce."

"Another message, sire, has been received from General Riose."

"Oh? And to what effect?"

"He has spied out the land of these barbarians and advocates an expedition in force. His arguments are long and fairly tedious. It is not worth annoying your Imperial Majesty with it at present, during your indisposition. Particularly since it will be discussed at length during the session of the Council of Lords." He glanced sidewise at the Emperor.

Cleon II frowned. "The Lords? Is it a question for them, Brodrig? It will mean further demands for a broader interpretation of the

Charter. It always comes to that."

"It can't be avoided, sire. It might have been better if your august father could have beat down the last rebellion without granting the Charter. But since it is here, we must endure it for the while."

"You're right, I suppose. Then the lords it must be. But why all this solemnity, man? It is, after all, a minor point. Success on a remote border with limited troops is scarcely a state affair."

Brodrig smiled narrowly. He said coolly, "It is an affair of a romantic idiot; but even a romantic idiot can be a deadly weapon when an unromantic rebel uses him as a tool. Sire, the man was popular here and is popular there. He is young. If he annexes a vagrant barbarian planet or two, he will become a conqueror. Now a young conqueror who has proven his ability to rouse the enthusiasm of pilots, miners, tradesmen and suchlike rabble is dangerous at any time. Even if he lacked the desire to do to you as your august father did to the usurper, Ricker, then one of our loyal Lords of the Domain may decide to use him as his weapon."

Cleon II moved an arm hastily and stiffened with the pain. Slowly he relaxed, but his smile was weak, and his voice a whisper. "You are a valuable subject, Brodrig. You always suspect far more than is necessary, and I have but to take half your suggested precautions to be utterly safe. We'll put it up to the lords. We shall see what they say and take our measures accordingly. The young man, I suppose, has made no hostile moves yet."

"He reports none. But already he asks for reinforcements."

"Reinforcements!" The Emperor's eyes narrowed with wonder. "What force has he?"

"Ten ships of the line, sire, with a full complement of auxiliary vessels. Two of the ships are equipped with motors salvaged from the old Grand Fleet, and one has a battery of power artillery from the same source. The other ships are new ones of the last fifty years, but are serviceable, nevertheless."

"Ten ships would seem adequate for any reasonable undertaking. Why, with less than ten ships my father won his first victories against the usurper. Who *are* these barbarians he's fighting?"

The Privy Secretary raised a pair of supercilious eyebrows. "He refers to them as 'the Foundation.'"

"The Foundation? What is it?"

"There is no record of it, sire. I have searched the archives carefully. The area of the Galaxy indicated falls within the ancient province of Anacreon, which two centuries since gave itself up to brigandage, barbarism, and anarchy. There is no planet known as Foundation in the province, however. There was a vague reference to a group of scientists sent to that province just before its separation from our protection. They were to prepare an Encyclopedia." He smiled thinly. "I believe they called it the Encyclopedia Foundation."

"Well," the Emperor considered it somberly, "that seems a tenuous connection to advance."

"I'm not advancing it, sire. No word was ever received from that expedition after the growth of anarchy in that region. If their descendants still live and retain their name, then they have reverted to barbarism most certainly."

"And so he wants reinforcements." The Emperor bent a fierce glance at his secretary. "This is most peculiar; to propose to fight savages with ten ships and to ask for more before a blow is struck. And yet I begin to remember this Riose: he was a handsome boy of loyal family. Brodrig, there are complications in this that I don't penetrate. There may be more importance in it than would seem."

His fingers played idly with the gleaming sheet that covered his stiffened legs. He said, "I need a man out there; one with eyes, brains and loyalty. Brodrig—"

The secretary bent a submissive head, "And the ships, sire?"

"Not yet!" The Emperor moaned softly as he shifted his position in gentle stages. He pointed a feeble finger, "Not till we know more. Convene the Council of Lords for this day week. It will be a good opportunity for the new appropriation as well. I'll put *that* through or lives will end."

He leaned his aching head into the soothing tingle of the force-field pillow, "Go now, Brodrig, and send in the doctor. He's the worst bumbler of the lot."

V.

From the radiating point of Siwenna, the forces of the Empire reached out cautiously into the black unknown of the Periphery. Giant ships passed the vast distances that separated the vagrant stars at the Galaxy's rim, and felt their way around the outermost edge of Foundation influence.

Worlds isolated in their new barbarism of two centuries felt the sensation once again of Imperial overlords upon their soil. Allegiance was sworn in the face of the massive artillery covering capital cities.

Garrisons were left; garrisons of men in Imperial uniform with the Spaceship-and-Sun insignia upon their shoulders. The old men took notice and remembered once again the forgotten tales of their grandfathers' fathers of the times when the universe was big, and rich, and peaceful and that same Spaceship-and-Sun ruled all.

Then the great ships passed on to weave their line of forward bases further around the Foundation. And as each world was knotted into its proper place in the fabric, the report went back to Bel Riose at the General Headquarters he had established on the rocky barrenness of a wandering sunless planet.

Now Riose relaxed and smiled grimly at Ducem Barr. "Well, what do *you* think, patrician?"

"I? Of what value are my thoughts? I am not a military man." He took in with one wearily distasteful glance the crowded disorder of the rock-bound room which had been carved out of the wall of a cavern of artificial air, light, and heat which marked the single bubble of life in the vastness of a bleak world.

"For the help I could give you," he muttered, "or would want to give you, you might return me to Siwenna."

"Not yet. Not yet." The general turned his chair to the corner which held the huge, brilliantly-transparent sphere that mapped the old Imperial prefect of Anacreon and its neighboring sectors. "Later, when this is over, you will go back to your books and to more. I'll see to it that the estates of your family are restored to you and to your children for the rest of time."

"Thank you," said Barr, with faint irony, "but I lack your faith in the happy outcome of all this."

Riose laughed harshly, "Don't start your prophetic croakings again. This map speaks louder than all your woeful theories." He caressed its curved invisible outline gently. "Can you read a map in radial projection? You can? Well, here, see for yourself. The stars in gold represent the Imperial territories. The red stars are those in subjection to the Foundation and the pink are those which are probably within the economic sphere of influence. Now watch—"

Riose's hand covered a rounded knob, and slowly an area of hard, white pinpoints changed into a deepening blue. Like an inverted cup they folded about the red and the pink.

"Those blue stars have been taken over by my forces," said Riose with quiet satisfaction, "and they still advance. No opposition has appeared anywhere. The barbarians are quiet, And particularly, no opposition has come from Foundation forces. They sleep peacefully and well."

"You spread your force thinly, don't you?" asked Barr.

"As a matter of fact," said Riose, "despite appearances, I don't. The key points which I garrison and fortify are relatively few, but they are carefully chosen. The result is that the force expended is small, but the strategic result great. There are many advantages, more than would ever appear to any one who hasn't made a careful study of spatial tactics, but it is apparent to anyone, for instance, that I can base an attack from any point in an inclosing sphere, and that when I am finished it will be impossible for the Foundation to attack at flank or rear. I shall have no flank or rear with respect to them.

"This strategy of the Previous Inclosure has been tried before, notably in the campaigns of Loris VI, some two thousand years ago, but always imperfectly; always with the knowledge and attempted interference of the enemy. This is different."

"The ideal textbook case?" Barr's voice was languid and indifferent.

Riose was impatient, "You still

think my forces will fail?"

"They must."

"You understand that there is no case in military history where an Inclosure has been completed that the attacking forces have not eventually won, except where an outside Navy exists in sufficient force to break the Inclosure."

"If you say so."

"And you still adhere to your faith."

"Yes."

Riose shrugged, "Then do so."

Barr allowed the angry silence to continue for a moment, then asked quietly, "Have you received an answer from the Emperor?"

Riose removed a cigarette from a wall container behind his head, placed filter tip between his lips and puffed it aflame carefully. He said, "You mean my request for reinforcements? It came, but that's all. Just the answer."

"No ships."

"None. I half-expected that. Frankly, patrician, I should never have allowed myself to be stampeded by your theories into requesting them in the first place. It puts me in a false light."

"Does it?"

"Definitely. Ships are at a premium. The civil wars of the last two centuries have smashed up more than half of the Grand Fleet and what's left is in pretty shaky conditions. You know it isn't as if the ships we build these days are worth anything. I don't think there's a man in the Galaxy today who can build a first-rate hyperatomic motor."

"I knew that," said the Siwennian. His eyes were thoughtful and introspective. "I didn't know that *you* knew it. So his Imperial Majesty can spare no ships. Psychohistory could have predicted that; in fact, it probably did. I should say that Hari Seldon's dead hand wins the opening round."

Riose answered sharply, "I have enough ships as it is. Your Seldon wins nothing. Should the situation turn more serious, then more ships *will* be available. As yet, the Emperor does not know all the story."

"Indeed? What haven't you told him?"

"Obviously — your theories." Riose looked sardonic. "The story is, with all respect to you, inherently improbable. If developments warrant; if events supply me with proof, then, but only then, would I make out the case of mortal danger.

"And in addition," Riose drove on, casually, "the story, unbolstered by fact, has a flavor of *lese majeste* that could scarcely be pleasant to His Imperial Majesty."

The old patrician smiled. "You mean that telling him his august throne is in danger of subversion by a parcel of ragged barbarians from the ends of the universe is not a warning to be believed or appreciated. Then you expect nothing from him."

"Unless you count a special envoy as something."

"And why a special envoy?"

"It's an old custom. A direct representative of the crown is present on every military campaign which is under government auspices."

"Really? Why?"

"It's a method of preserving the symbol of personal Imperial leadership in all campaigns. It's gained a secondary function of insuring the fidelity of generals. It doesn't always succeed in that respect."

"You'll find that inconvenient, general. Extraneous authority, I mean."

"I don't doubt that." Riose reddened faintly, "But it can't be helped—"

The receiver at the general's hand glowed warmly, and with an unobtrusive jar, the cylindered communication popped into its slot. Riose unrolled it, "Good! This is it!"

Ducem Barr raised a mildly questioning eyebrow.

Riose said, "You know we've captured one of these Trader people. Alive—and with his ship intact."

"I've heard talk of it."

"Well, they've just brought him in, and we'll have him here in a minute. You keep your seat, patrician. I want you here when I'm questioning him. It's why I asked you here today in the first place. You may understand him where I might miss important points."

The door signal sounded and a touch of the general's toe swung the door wide. The man who stood on the threshold was tall and bearded, wore a short coat of a soft, leathery plastic, with an attached hood shoved back on his neck. His hands were free, and if he noticed the men about him were armed, he did not trouble to indicate it.

He stepped in casually, and looked about with calculating eyes. He favored the general with a rudimentary wave of the hand and a half nod.

"Your name?" demanded Riose, crisply.

"Lathan Devers." The trader hooked his thumbs into his wide and gaudy belt, "Are you the boss here?"

"You are a trader of the Foundation?"

"That's right. Listen, if you're the boss, you'd better tell your hired men here to lay off my cargo."

The general raised his head and regarded the prisoner coldly, "Answer questions. Do not volunteer orders."

"All right. I'm agreeable. But one of your boys blasted a two-foot hole in his chest already, by sticking his fingers where he wasn't supposed to."

Riose shifted his gaze to the lieutenant in charge, "Is this man telling the truth? Your report, Vrank, had it that no lives were lost."

"None were, sir," The lieutenant spoke stiffly, apprehensively, "at the time. There was later some disposition to search the ship, there having arisen a rumor that a woman was aboard. Instead, sir, many instruments of unknown nature were located, instruments which the prisoner claims to be his stock in trade. One of them flashed on handling, and the soldier holding it died."

The general turned back to the

trader, "Does your ship carry atomic explosives."

"Galaxy, no. What for? That fool grabbed an atomic puncher, wrong end forward and set at maximum dispersion. You're not supposed to do that. Might as well point a neut-gun at your head. I'd have stopped him, if five men weren't sitting on my chest."

Riose gestured at the waiting guard, "You go. The captured ship is to be sealed against all intrusion. Sit down, Devers."

The trader did so, in the spot indicated, and withstood stolidly the hard scrutiny of the Imperial general and the curious glance of the Siwennian patrician.

Riose said, "You're a sensible man, Devers."

"Thank you. Are you impressed by my face, or do you want something? Tell you what, though. I'm a good business man."

"It's about the same thing. You surrendered your ship when you might have decided to waste our ammunition and have yourself blown to electron-dust. It could result in good treatment for you, if you continue that sort of outlook on life."

"Good treatment is what I mostly crave, boss."

"Good, And co-operation is what I mostly crave." Riose smiled, and said in a low aside to Ducem Barr, "I hope the word 'crave' means what I think it does. Did you ever hear such a barbarous jargon?"

Devers said blandly, "Right. I check you. But what kind of co-operation are you talking about, boss? To tell you straight, I don't know where I stand." He looked about him, "Where's this place, for instance, and what's the idea?"

"Ah, I've neglected the other half of the introductions. I apologize." Riose was in good humor, "That gentleman is Ducem Barr, Patrician of the Empire. I am Bel Riose, Peer of the Empire, and General of the Third Class in the armed forces of His Imperial Majesty."

The trader's jaw slackened. Then, "The Empire? I mean the old Empire they taught us about at school? Huh! Funny! I always had the sort of notion that it didn't exist any more."

"Look about you. It does," said Riose grimly.

"Might have known it though," and Lathan Devers pointed his beard at the ceiling. "That was a mighty polished-looking set of craft that took my tub. No kingdom of the Periphery could have turned them out." His brow furrowed, "So what's the game, boss? Or do I call you general?"

"The game is war."

"Empire versus Foundation, that it?"

"Right."

"Why?"

"I think you know why."

The trader stared sharply and shook his head.

Riose let the other deliberate, then said softly, "I'm sure you know why."

Lathan Devers muttered, "Warm here," and stood up to remove his hooded jacket. Then he sat down again and stretched his legs out before him.

"You know," he said, comfortably, "I figure you're thinking I ought to jump up with a whoop and lay about me. I can catch you before you could move if I choose my time, and this old fellow who sits there and doesn't say anything couldn't do much to stop me."

"But you won't," said Riose, comfidently.

"I won't," agreed Devers, amiably. "First off, killing you wouldn't stop the war, I suppose. There are more generals where you came from."

"Very accurately calculated."

"Besides which, I'd probably be slammed down about two seconds after I got you, and killed fast, or maybe slow, depending. But I'd be killed, and I never like to count on that when I'm making plans. It doesn't pay off."

"I said you were a sensible man."

"But there's one thing I would like, boss. I'd like you to tell me what you mean when you say I know why you're jumping us. I don't; and guessing games bother me no end."

"Yes? Ever hear of Hari Seldon?"

"No. I *said* I don't like guessing games."

Riose flicked a side glance at Ducem Barr who smiled with a narrow gentleness and resumed his inwardly-dreaming expression.

Riose said with a grimace, "Don't *you* play games, Devers. There is a tradition, or a fable, or sober history—I don't care what—upon your Foundation, that eventually you will found the Second Empire. I know quite a detailed version of Hari Seldon's psycho-historical claptrap, and your eventual plans of aggression against the Empire."

"That so?" Devers nodded thoughtfully. "And who told you all that?"

"Does that matter?" said Riose with dangerous smoothness. "You're here to question nothing. I want what you know about the Seldon Fable."

"But if it's a Fable—"

"Don't play with words, Devers."

"I'm not. In fact, I'll give it to you straight. You know all I know about it. It's silly stuff, half-baked. Every world has its yarns; you can't keep it away from them. Yes, I've heard that sort of talk: Seldon, Second Empire and so on. They put kids to sleep at night with the stuff. The young squirts curl up in the spare rooms with their pocket projectors and suck up Seldon thrillers. But it's strictly non-adult. Non-intelligent-adult, anyway." The trader shook his head.

The Imperial general's eyes were dark, "Is that really so? You waste your lies, man. I've been on the planet, Terminus. I know your Foundation. I've looked it in the face."

"And you ask me? Me, when I haven't kept foot on it for two months at a piece in ten years. You *are* wasting your time. But go ahead with your war, if it's fables you're after."

And Barr spoke for the first time, mildly, "You are so confident then that the Foundation will win?"

The trader turned. He flushed faintly and an old scar on one temple showed whitely, "Hm-m-m, the silent partner. How'd you squeeze *that* out of what I said, doc?"

Riose nodded very slightly at Barr, and the Siwennian continued in a low voice, "Because the notion *would* bother you if you thought your world might lose this war, and suffer the bitter reapings of defeat. I know. *My* world once did, and still does."

Lathan Devers fumbled his beard, looked from one of his opponents to the other, then laughed shortly, "Does he always talk like that, boss. Listen," he grew serious, "what's defeat? I've seen wars and I've seen defeats. What if the winner does take over? Who's bothered? Me? Guys like me?" He shook his head in derision.

"Get this," the trader spoke forcefully and earnestly, "there are five or six fat slobs who usually run an average planet. They get the rabbit punch, but I'm not losing peace of mind over them. See. The people? The ordinary run of guys? Sure, some get killed, and the rest pay extra taxes for a while. But it settles itself out; it runs itself down. And then it's the old situation again with a different five or six."

Ducem Barr's nostrils flared, and the tendons of his old right hand jerked; but he said nothing.

Lathan Devers' eyes were on him. They missed nothing. He said, "Look. I spend my life in space for my five-and-dime gadgets and my beer-and-pretzel kickback from the combines. There's fat fellows back there," his thumb jerked over his shoulder and back, "that sit home and collect my year's income every minute—out of skimmings from me and more like me. Suppose *you* run the Foundation. You'll still need us. You'll need us more than ever the Combines do—because you'd not know your way around, and we could bring in the hard cash. We'd make a better deal with the Empire. Yes, we would; and I'm a man of business. If it adds up to a plus mark, I'm for it."

And he stared at the two with sardonic belligerence.

The silence remained unbroken for minutes, and then a cylinder rattled into its slot. The general flipped it open, glanced at the neat printing and in-circuited the visuals with a sweep.

"Prepare plan indicating position of each ship in action. Await orders on full-armed defensive."

He reached for his cape. As he fastened it about his shoulders, he whispered in a stiff-lipped monotone to Barr, "I'm leaving this man to you. I'll expect results. This is war and I can be cruel to failures. Remember!" He left, with a salute to both.

Lathan Devers looked after him, "Well, something's hit him where it hurts. What goes on?"

"A battle, obviously," said Barr, gruffly. "The forces of the Foundation are coming out for their first battle. You'd better come along."

There were armed soldiers in the room. Their bearing was respectful and their faces were hard. Devers followed the proud old Siwennian patriarch out of the room.

The room to which they were led was smaller, barer. It contained two beds, a visi-screen, and shower and sanitary facilities. The soldiers marched out, and the thick door boomed hollowly shut.

"Hmp?" Devers stared disapprovingly about. "This looks permanent."

"It is," said Barr, shortly. The old Siwennian turned his back.

The trader said irritably, "What's your game, doc?"

"I have no game. You're in my charge, that's all."

The trader rose and advanced. His bulk towered over the unmoving patrician, "Yes? But you're in this cell with me and when you were marched here the guns were pointed just as hard at you as at me. Listen, you were all boiled up about my notions on the subject of war and peace."

He waited fruitlesly, "All right, let me ask you something. You said *your* country was licked once. By whom? Comet people from the outer nebulae?"

Barr looked up, "By the Empire?"

"That so? Then what are you doing here?"

Barr maintained an eloquent silence.

The trader thrust out a lower lip and nodded his head slowly. He slipped off the flat-linked bracelet that hugged his right wrist and held it out. "What do you think of that?" He wore the mate to it on his left.

The Siwennian took the ornament. He responded slowly to the trader's gesture and put it on. The odd tingling at the wrist passed away quickly.

Devers' voice changed at once, "Right, doc, you've got the action now. Just speak casually. If this room is wired, they won't get a thing. That's a Field Distorter you've got there; genuine Mallow design. Sells for twenty-five credits on any world from here to the outer rim. You get it free. Hold your lips still when you talk and take it easy. You've got to get the trick of it."

Ducem Barr was suddenly weary. The trader's boring eyes were luminous and urging. He felt unequal to their demands.

Barr said, "What do you want?" The words slurred from between unmoving lips.

"I've told you. You make mouth noises like what we call a patriot. Yet your own world has been mashed up by the Empire, and here you are playing ball with the Empire's fair-haired general. Doesn't make sense, does it?"

Barr said, "I have done my part. A conquering Imperial viceroy is dead because of me."

"That so? Recently?"

"Forty years ago."

"Forty . . . years . . . ago!" The words seemed to have meaning to the trader. He frowned, "That's a long time to live on memories. Does that young squirt in the general's uniform know about it?"

Barr nodded.

Devers' eyes were dark with thought, "You want the Empire to win?"

And the old Siwennian patrician broke out in sudden deep anger, "May the Empire and all its works perish in universal catastrophe. All Siwenna prays that daily. I had brothers once; a sister; a father. But I have children now; grandchildren. The general knows where to find them."

Devers waited.

Barr continued in a whisper. "But that would not stop me if the results in view warranted the risk. They would know how to die."

The trader said gently, "You killed a viceroy once, huh? You know, I recognize a few things. We once had a mayor, Hober Mallow his name was. He visited Siwenna; that's your world, isn't it? He met a man named Barr."

Ducem Barr stared hard, suspiciously. "What do you know of this?"

"What every trader on the Foundation knows. You might be a smart old fellow put in here to get on my right side. Sure, they'd point guns at you, and you'd hate the Empire and be all-out for its smashing. Then I'd fall all over you and pour out my heart to you, and wouldn't the general be pleased. There's not much chance of that, doc.

"But just the same I'd like to see you prove that you're the son of Onum Barr of Siwenna—the sixth and youngest who escaped the massacre."

Ducem Barr's hand shook as he opened the flat metal box in a wall recess. The metal object he withdrew clanked softly as he thrust it into the trader's hands.

"Look at that," he said.

Devers stared. He held the swollen central link of the chain close to his eyes and swore softly, "That's Mallow's monogram, or I'm a space-struck rookie, and the design if fifty years old if it's a day."

He looked up and smiled.

"Shake, doc. A man-size atomic shield is all the proof I need," and he held out his large hand.

VI.

The tiny ships had appeared out of the vacant depths and darted into the midst of the Armada. Without a shot or a burst of energy, they weaved through the ship-swollen area, then blasted on and out, while the Imperial wagons turned after them like lumbering beasts. There were two noiseless flares that pinpointed space as two of the tiny gnats shriveled in atomic disintegration, and the rest were gone.

The great ships searched, then returned to their original task, and world by world, the great web of the Inclosure continued.

Brodrig's uniform was stately; carefully tailored and as carefully worn. His walk through the gardens of the obscure planet Wanda, now temporary Imperial headquarters, was leisurely: his expression somber.

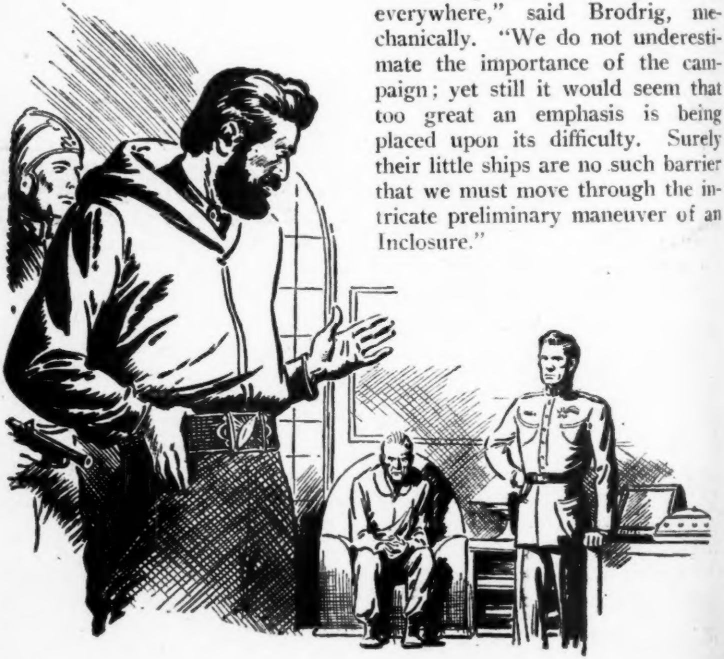
Bel Riose walked with him, his field uniform open at the collar, and doleful in its monotonous gray-black.

Riose indicated the smooth black bench under the fragrant tree-fern whose large spatulate leaves lifted flatly against the white sun. "See that, sir. It is a relic of the Imperium. The ornamented benches, built for lovers, linger on, fresh and useful, while the factories and the palaces collapse into unremembered ruin."

He seated himself, while Cleon II's Privy Secretary stood erect before him and clipped the leaves above neatly with precise swings of his ivory staff.

Riose crossed his legs and offered a cigarette to the other. He fingered one himself as he spoke, "It is what one would expect from the enlightened wisdom of His Imperial Majesty to send so competent an observer as yourself. It relieves any anxiety I might have felt that the press of more important and more immediate business might perhaps force into the shadows a small campaign on the Periphery."

"The eyes of the Emperor are everywhere," said Brodrig, mechanically. "We do not underestimate the importance of the campaign; yet still it would seem that too great an emphasis is being placed upon its difficulty. Surely their little ships are no such barrier that we must move through the intricate preliminary maneuver of an Inclosure."



Riose flushed, but he maintained his equilibrium, "I cannot risk the lives of my men, who are few enough, or the destruction of my ships, which are irreplaceable, by a too-rash attack. The establishment of an Inclosure will quarter my casualties in the ultimate attack, howsoever difficult it be. The military reasons for that I took the liberty to explain yesterday."

"Well, well, I am not a military man. In this case, you assure me that what seems patently and obviously right is, in reality, wrong. We will allow that. Yet your caution shoots far beyond that. In your second communication, you requested re-inforcements. And these, against an enemy poor, small, and barbarous, with whom you have had no one skirmish at the time. To desire more forces under the circumstances would savor almost of incapacity or worse, had not your earlier career given sufficient proof of your boldness and imagination."

"I thank you," said the general, coldly, "but I would remind you that there is a difference between boldness and blindness. There is a place for a decisive gamble when you know your enemy and can calculate the risks at least roughly; but to move at all against an *unknown* enemy is boldness in itself. You might as well ask why the same man sprints safely across an obstacle course in the day, and falls over the furniture in his room at night."

Brodrig swept away the other's words with a neat flirt of the fingers, "Dramatic, but not satisfactory. You have been to this barbarian world yourself. You have in addition this enemy prisoner you coddle, this trader. Between yourself and the prisoner you are not in a night fog."

"No? I pray you to remember that a world which has developed in isolation for two centuries cannot be interpreted to the point of intelligent attack by a month's visit. I am a soldier, not a cleft-chinned, barrel-chested hero of a subetheric trimensional thriller. Nor can a single prisoner, and one who is an obscure member of an economic group which has no close connection with the enemy world introduce me to all the inner secrets of enemy strategy."

"You have questioned him?"

"I have."

"Well?"

"It has been useful, but not vitally so. His ship is tiny, of no account. He sells little toys which are amusing if nothing else. I have a few of the cleverest which I intend sending to the Emperor as curiosities. Naturally, there is a good deal about the ship and its workings which I do not understand, but I am not a tech-man."

"But you have among you those who are," pointed out Brodrig.

"I, too, am aware of that," replied the general in faintly caustic tones. "But the fools have far to go before they could meet my needs. I have already sent for clever men who can understand the workings of the odd atomic field-circuits the ship contains. I have received no answer."

"Men of that type cannot be spared, general. Surely, there must be one man of your vast province who understands atomics."

"Were there such a one, I would have him heal the limping, invalid motors that power two of my small fleet of ships. Two ships of my meager ten that cannot fight a major battle for lack of sufficient power supply. One fifth of my force condemned to the carrion activity of consolidating positions behind the lines."

The secretary's fingers fluttered impatiently. "Your position is not unique in that respect, general. The Emperor has similar troubles."

The general threw away his shredded, never-lit cigarette, lit another, and shrugged, "Well, it is beside the immediate point, this lack of first-class tech-men. Except that I might have made more progress with my prisoner were my Psychic Probe in proper order."

The secretary's eyebrows lifted, "You have a Probe?"

"An old one. A superannuated one which fails me the one time I needed it. I set it up during the prisoner's sleep, and received nothing. So much for the Probe. I have tried it on my own men and the reaction is quite proper, but again there is not one among my staff of tech-men who can tell me why it fails upon the prisoner. Ducem Barr, who is a theoretician of parts, though no mechanic, says the Psychic structure of the prisoner may be unaffected by the Probe since from childhood he has been subjected to alien environments and neural stimuli. I don't know. But he may yet be useful. I save him in that hope."

Brodrig leaned on his staff. "I shall see if a specialist is available in the capital. In the meanwhile, what of this other man you just mentioned, this Siwennian? You keep too many enemies in your good graces."

"He knows the enemy. He, too, I keep for future reference and the help he may afford me."

"But he is a Siwennian and the son of a proscribed rebel."

"He is old and powerless, and his family acts as hostage."

"I see. Yet I think that I should speak to this trader myself."

"Certainly."

"Alone," the secretary added coldly, making his point.

"Certainly," repeated Riose, blandly. "As a loyal subject of the Emperor, I accept his personal representative as my superior. However, since the trader is at the permanent base, you will have to leave the front areas at an interesting moment."

"Yes? Interesting in what way?"

"Interesting in that the Inclosure is complete today. Interesting in that within the week, the Twentieth Fleet of the Border advances inward towards the core of resistance." Riose smiled and turned away.

In a vague way, Brodrig felt punctured.

VII.

Sergeant Mori Luk made an ideal soldier of the ranks. He came from the huge agricultural planets of the Pleiades where only army life could break the bond to the soil and the unavailing life of drudgery; and he was typical of that background. Unimaginative enough to face danger without fear; he was strong and agile enough to face it sucessfully. He accepted orders instantly, drove the men under him unbendingly and adored his general unswervingly.

And yet with that, he was of a sunny nature. If he killed a man in the line of duty without a scrap of hesitation, it was also without a scrap of animosity.

That Sergeant Luk should signal at the door before entering was further a sign of tact, for he would have been perfectly within his rights to enter without signaling.

The two within looked up from their evening meal and one reached out with his foot to cut off the cracked voice which rattled out of the battered pocket-transmitter with bright liveliness.

"More books?" asked Lathan Devers.

The sergeant held out the tightly-wound cylinder of film and scratched his neck, "It belongs to Engineer Orre, but he'll have to have it back. He's going to send it to his kids, you know, like what you might call a souvenir, you know."

Ducem Barr turned the cylinder in his hands with interest. "And where did the engineer get it? He hasn't a transmitter also, has he?"

The sergeant shook his head emphatically. He pointed to the knocked-about remnant at the foot of the bed. "That's the only one in the place. This fellow, Orre, now, he got that book from one of these pig-pen worlds out here we captured. They had it in a big building by itself and he had to kill a few of the natives that tried to stop him from taking it."

He looked at it appraisingly. "It makes a good souvenir—for kids."

He paused, then said stealthily, "There's big news floating about, by the way. It's only scuttlebut, but even so, it's too good to keep. The general did it again." And he nodded slowly, gravely.

"That so?" said Devers. "And what did he do?"

"Finished the Inclosure, that's all." The sergeant chuckled with a fatherly pride. "Isn't he the corker, though? Didn't he work it fine? One of the fellows who's strong on fancy talk, says it went as smooth and even as the music of the spheres, whatever they are."

"The big offensive starts now?" asked Barr, mildly.

"Hope so," was the boisterous response. "I want to get back on my ship now that my arm is in one piece again. I'm tired of sitting on my scupper out here."

"So am I," muttered Devers, suddenly and savagely. There was a bit of underlip caught in his teeth, and he worried it.

The sergeant looked at him doubtfully, and said, "I'd better go now. The captain's round is due and I'd just as soon he didn't catch me in here."

He paused at the door. "By the way, sir," he said with sudden, awkward shyness to the trader, "I heard from my wife. She says that little freezer you gave me to send her works fine. It doesn't cost her anything, and she just about keeps a month's supply of food froze up complete. I appreciate it."

"It's all right. Forget it."

The great door moved noiselessly shut behind the grinning sergeant.

Ducem Barr got out of his chair. "Well, he gives us a fair return for the freezer. Let's take a look at this new book. Ahh, the title is gone."

He unrolled a yard or so of the film and looked through at the light. Then he murmured, "Well, skewer me through the scupper, as the sergeant says. This is 'The Garden of Summa,' Devers."

"That so?" said the trader, without interest. He shoved aside what was left of his dinner. "Sit down, Barr. Listening to this old-time literature isn't doing me any good. You heard what the sergeant said?"

"Yes, I did. What of it?"

"The offensive will start. And we sit here?"

"Where do you want to sit?"

"You know what I mean. There's no use just waiting."

"Isn't there?" Barr was carefully removing the old film from the transmitter and installing the new. "You told me a good deal of Foundation history in the last month, and it seems that the great leaders of past crises did precious little more than sit—and wait."

"Ah, Barr, but they knew where they were going."

"Did they? I suppose they said they did when it was over, and for all I know, maybe they did. But there's no proof that things would not have worked out as well or better if they had not known where they were going. The deeper economic and sociological forces aren't directed by individual men."

Devers sneered. "No way of telling that things wouldn't have worked out worse, either. You're arguing tail-end backwards." His eyes were brooding. "You know, suppose I blasted him?"

"Whom? Riose?"

"Yes."

Barr sighed. His aging eyes were troubled with a reflection of the long past. "Assassination isn't the way out, Devers. I once tried it, under provocation, when I was twenty—but it solved nothing. I removed a villain from Siwenna, but not the Imperial yoke; and it was the Imperial yoke and not the villain that mattered."

"But Riose is not just a villain, doc. He's the whole blamed army. It would fall apart without him. They hang on him like babies. The sergeant out there slobbers every time he mentions him."

"Even so. There are other armies and other leaders. You must go deeper. There is this Brodrig, for instance—no one more than he has the ear of the Emperor. He could demand hundreds of ships where Riose must struggle with ten.

I know him by reputation."

"That so? What about him?" The trader's eyes lost in frustration, what they gained in sharp interest.

"You want a pocket outline? He's a low-born rascal who has by unfailing flattery tickled the whims of the Emperor. He's well-hated by the court aristocracy, vermin themselves, because he can lay claim to neither family nor humility. He is the Emperor's adviser in all things, and the Emperor's tool in the worst things. He is faithless by choice but loyal by necessity. There is not a man in the Empire as subtle in villainy or as crude in his pleasures. And they say there is no way to the Emperor's favor but through him; and no way to his, but through infamy."

"Wow!" Devers pulled thoughtfully at his neatly trimmed beard. "And he's the old boy the Emperor sent out here to keep an eye on Riose. Do you know I have an idea?"

"I do now."

"Suppose this Brodrig takes a dislike to our young Army's Delight?"

"He probably has already. He's not noted for a capacity for liking."

"Suppose it gets really bad. The Emperor might hear about it, and Riose might get in trouble."

"Uh-huh. Quite likely. But how do you propose to get that to happen?"

"I don't know. I suppose he could be bribed?"

The patrician laughed gently. "Yes, in a way, but not in the manner you bribed the sergeant—not with a pocket freezer. And even if you reach his scale, it wouldn't be worth it. There's probably no one so easily bribed, but he lacks even the fundamental honesty of honorable corruption. He doesn't *stay* bribed; not for any sum. Think of something else."

Devers swung a leg over his knee and his toe nodded quickly and restlessly. "It's the first hint, though—"

He stopped; the door signal was flashing once again, and the sergeant was on the threshold once more. He was excited, and his broad face was red and unsmiling.

"Sir," he began, in an agitated attempt at deference, "I am very thankful for the freezer, and you have always spoken to me very fine, although I am only the son of a farmer and you are great lords."

His Pleiad accent had grown thick, almost too much so for easy comprehension; and with excitement, his lumpish peasant derivation wiped out completely the soldierly bearing so long and so painfully cultivated.

Barr said softly, "What is it, sergeant?"

"Lord Brodrig is coming to see you. Tomorrow! I know, because the captain told me to have my men ready for dress review tomorrow for . . . for him. I thought—I might warn you."

Barr said, "Thank you, sergeant, we appreciate that. But it's all right, man: no need for—"

But the look on Sergeant Luk's face was now unmistakably one of fear. He spoke in a rough whisper, "You don't hear the stories the men tell about him. He has sold himself to the space fiend. No, don't laugh. There are most terrible tales told about him. They say he has men with blast-guns who follow him everywhere, and when he wants pleasure, he just tells them to blast down anyone they meet. And they do—and he laughs. They say even the Emperor is in terror of him, and that he forces the Emperor to raise taxes and won't let him listen to the complaints of the people.

"And he hates the general, that's what they say. They say he would like to kill the general, because the general is so great and wise. But he can't, because our general is a match for anyone and he knows Lord Brodrig is a bad 'un."

The sergeant blinked; smiled in a sudden, incongruous shyness at his own outburst; and backed toward the door. He nodded his head, jerkily. "You mind my words. Watch him."

He ducked out.

And Devers looked up, hard-eyed. "This breaks things our way, doesn't it, doc?"

"It depends," said Barr, dryly, "on Brodrig, doesn't it?"

But Devers was thinking, not listening.

He was thinking hard.

Lord Brodrig ducked his head as he stepped into the cramped living quarters of the trading ship, and his two armed guards followed quickly, with bared guns and the professionally hard scowl of the hired bravo.

The Privy Secretary had little of the look of the lost soul about him just then. If the space fiend had bought him, he had left no visible mark of possession. Rather might Brodrig have been considered a breath of court-fashion come to enliven the hard, bare ugliness of an army base.

The stiff, tight lines of his sheened and immaculate costume gave him the illusion of height, from the very top of which his cold, emotionless eyes stared down the declivity of a long nose at the trader. The mother-of-pearl ruches at his wrists fluttered filmily as he brought his ivory stick to the ground before him and leaned upon it daintily.

"No," he said, with a little gesture, "you remain here. Forget your toys; I am not interested in them."

He drew forth a chair, dusted it carefully with the iridescent square of fabric attached to the top of his white stick, and seated himself. Devers glanced towards the mate to the chair, but Brodrig said lazily, "You will stand in the presence of a Peer of the Realm."

He smiled.

Devers shrugged. "If you're not interested in my stock in trade, what am I here for?"

The Privy Secretary waited coldly, and Devers added a slow, "Sir."

"For privacy," said the secretary. "Now is it likely that I would come two hundred parsecs through space to inspect trinkets? It's *you* I want to see." He extracted a small pink tablet from an engraved box and placed it delicately between his teeth. He sucked it slowly and appreciatively.

"For instance," he said, "who are you? Are you really a citizen of this barbarian world that is creating all this fury of military frenzy?"

Devers nodded gravely.

"And you were really captured by him *after* the beginning of this squabble he calls a war. I am referring to our young general."

Devers nodded again.

"So! Very well, my worthy Outlander. I see your fluency of speech is at a minimum. I shall smooth the way for you. It seems that our general here is fighting an apparently meaningless war with frightful transports of energy—and this over a forsaken fleabite of a world at the end of nowhere, which to a logical man would not seem worth a single blast of a single gun. Yet the general is not illogical. On the contrary, I would say he was extremely intelligent. Do you follow me?"

"Can't say I do, sir."

The secretary inspected his fingernails and said, "Listen further, then. The general would not waste his men and ships on a sterile feat of glory. I know he *talks* of glory and of Imperial honor, but it is quite obvious that the affectation of being one of the insufferable old demigods of the Heroic Age won't wash. There is something more than glory here—and he does take queer, unnecessary care of you. Now if you were *my* prisoner and told *me* as little of use as you have our general, I would slit open your abdomen and strangle you with your own intestines."

Devers remained wooden. His eyes moved slightly, first to one of the secretary's bully-boys, and then to the other. They were ready; eagerly ready.

The secretary smiled. "Well, now, you're a silent devil. According to the general, even a Psychic Probe made no impression, and that was a mistake on his part, by the way, for it convinced me that our young military whizz-bang was lying." He seemed in high humor.

"My honest tradesman," he said, "I have a Psychic Probe of my own, one that ought to suit you peculiarly well. You see this—"

And between thumb and forefinger, held negligently, were intricately designed, pink-and-yellow rectangles which were most definitely obvious in identity.

Devers said so. "It looks like cash," he said.

"Cash it is—and the best cash of the Empire, for it is backed by my estates, which are more extensive than the Emperor's own. A hundred thousand credits. All here! Between two fingers! Yours!"

"For what, sir? I am a good trader, but all trades go in both directions."

"For what? For the truth! What is the general after? Why is he fighting this war?"

Lathan Devers sighed, and smoothed his beard thoughtfully.

"What he's after?" His eyes were following the motions of the secretary's hands as he counted the money slowly, bill by bill. "In a word, the Empire."

"*Hmp*. How ordinary! It always comes to that in the end. But how? What is the road that leads from the Galaxy's edge to the peak of Empire so broadly and invitingly?"

"The Foundation," said Devers, bitterly, "has secrets. They have books, old books—so old that the language they are in is only known to a few of the top men. But the secrets are shrouded in ritual and religion, and none may use them. I tried and now I am here—and there is a death sentence waiting for me, there."

"I see. And these old secrets? Come, for one hundred thousand I deserve the intimate details."

"The transmutation of elements," said Devers, shortly.

The secretary's eyes narrowed and lost some of their detachment, "I have been told that practical transmutation is impossible by the laws of atomics."

"So it is, if atomic forces are used. But the ancients were smart boys. There are sources of power greater than the atoms. If the Foundation used those sources as I suggested—"

Devers felt a soft, creeping sensation in his stomach. The bait was dangling; the fish was nosing it.

The secretary said suddenly, "Continue. The general, I am sure, is aware of all this. But what does he intend doing once he finishes this opera-bouffe affair?"

Devers kept his voice rock-steady. "With transmutation he controls the economy of the whole set-up of your Empire. Mineral holdings won't be worth a sneeze when Riose can make tungsten out of aluminum and iridium out of iron. An entire production system based on the scarcity of certain elements and the abundance of others is thrown completely out of whack. There'll be the greatest disjointment the Empire has ever seen, and only Riose will be able to stop it. *And* there is the question of this new power I mentioned, the use of which won't give Riose religious heebies.

"There's nothing that can stop him now. He's got the Foundation by the back of the neck, and once he's finished with it, he'll be Emperor in two years."

"So." Brodrig laughed lightly. "Iridium out of iron, that's what you said, isn't it? Come, I'll tell you a state secret. Do you know that the Foundation has already been in communication with the general?"

Devers' back stiffened.

"You look surprised. Why not; it seems logical now. They offered him a hundred tons of iridium a year to make peace. A hundred tons of *iron* converted to iridium in violation of their religious principles to save their necks. Fair enough, but no wonder our rigidly incorruptible general refused—when he can have the iridium and the Empire as well. And poor Cleon called him his one honest general. My bewhiskered merchant, you have earned your money."

He tossed it, and Devers scrambled after the flying bills.

Lord Brodrig stopped at the door and turned. "One reminder, trader. My playmates with the guns here have neither middle ears, tongues, education, or intelligence. They can neither hear, speak, write, or even make sense to a Psychic Probe. But they are very expert at interesting executions. I have bought you, man, at one hundred thousand credits. You will be good and worthy merchandise. Should you forget that you are bought at any time, and attempt to . . . say . . . repeat our conversation to Riose, you will be executed. But executed my way."

And in that delicate face there were sudden hard lines of eager cruelty that changed the studied smile into a red-lipped snarl. For one fleeting second, Devers saw that space fiend who had bought his buyer, look out of his buyer's eyes.

Silently, he preceded the two thrusting blast-guns of Brodrig's "playmates" to his quarters.

And to Ducem Barr's question, he said with brooding satisfaction, "No, that's the queerest part of it. *He* bribed *me*."

Two months of difficult war had left their mark on Bel Riose. There was heavy-handed gravity about him; and he was short-tempered.

It was with impatience that he addressed the worshiping Sergeant Luk. "Wait outside, soldier, and conduct these men back to their quarters when I am through. No one is to enter until I call. No one at all, you understand."

The sergeant saluted himself stiffly out of the room, and Riose with muttered disgust scooped up the waiting papers on his desk, threw them into the top drawer and slammed it shut.

"Take seats," he said shortly, to the waiting two. "I haven't much time. Strictly speaking, I shouldn't be here at all, but it is necessary to see you."

He turned to Ducem Barr, whose long fingers were caressing with interest the crystal cube in which was set the simulacrum of the lined, austere face of His Imperial Majesty, Cleon II.

"In the first place, patrician," said the general, "your Seldon is losing. To be sure, he battles well, for these men of the Foundation swarm like senseless bees and fight like madmen. Every planet is defended viciously, and once taken, every planet heaves so with rebellion it is as much trouble to hold as to conquer. But they are taken, and they are held. Your Seldon is losing."

"But he has not yet lost," murmured Barr, politely.

"The Foundation itself retains

less optimism. They offer me millions in order that I may not put this Seldon to the final test."

"So rumor goes."

"Ah, is rumor preceding me? Does it prate also of the latest?"

"What is the latest?"

"Why, that Lord Brodrig, the darling of the Emperor, is now second in command at his own request."

Devers spoke for the first time. "At his own request, boss? How come? Or are you growing to like the fellow?" He chuckled.

Riose said, calmly, "No, can't say I do. It's just that he bought the office at what I considered a fair and adequate price."

"Such as?"

"Such as a request to the Emperor for reinforcements."

Devers' contemptuous smile broadened. "He has communicated with the Emperor, huh? And I take it, boss, you're just waiting for these reinforcements, but they'll come any day. Right?"

"Wrong! They have already come. Five ships of the line; smooth and strong; with a personal message of congratulations from the Emperor, and more ships on the way. What's wrong, trader?" he asked, sardonically.

Devers spoke through suddenly frozen lips. "Nothing!"

Riose strode out from behind his desk and faced the trader, hand on the butt of his blast-gun.

"I say, what's wrong, trader? The news would seem to disturb you. Surely, you have no sudden birth of interest in the Foundation."

"I haven't."

"Yet—there are queer points about you."

"That so, boss?" Devers smiled tightly, and balled the fists in his pockets. "Just you line them up and I'll knock them down for you."

"Here they are. You were caught easily. You surrendered at first blow with a burnt-out shield. You're quite ready to desert your world, and that without a price. Interesting, all this, isn't it?"

"I crave to be on the winning side, boss. I'm a sensible man; you called me that yourself."

Riose said with tight throatiness, "Granted! Yet no trader since has been captured. No trade ship but has had the speed to escape at choice. No trade ship but has had a screen that could take all the beating a light cruiser could give it, should it choose to fight. And no trader but has fought to death when occasion warranted. Traders have been traced as the leaders and instigators of the guerilla warfare on occupied planets and of the flying raids in occupied space.

"Are you the *only* sensible man then? You neither fight nor flee, but turn traitor without urging. You are unique, amazingly unique—in fact, suspiciously unique."

Devers said softly, "I take your meaning, but you have nothing on me. I've been here now six months, and I've been a good boy."

"So you have, and I have repaid

you by good treatment. I have left your ship undisturbed and treated you with every consideration. Yet you fall short. Freely offered information, for instance, on your gadgets might have been helpful. The atomic principles on which they are built would seem to be used in some of the Foundation's nastiest weapons. Right?"

"I am only a trader," said Devers, "and not one of these big-wig technicians. I sell the stuff; I don't make it."

"Well, that will be seen shortly. "It is what I came here for. For instance, your ship will be searched for a personal force-shield. You have never worn one; yet all soldiers of the Foundation do. It will be significant evidence that there is information you do not choose to give me. Right?"

There was no answer. He continued, "And there will be more direct evidence. I have brought with me the Psychic Probe. It failed once before, but contact with the enemy is a liberal education."

His voice was smoothly threatening and Devers felt the gun thrust hard in his midriff—the general's gun, hitherto in its holster.

The general said quietly, "You will remove your wristband and any other metal ornament you wear and give them to me. Slowly! Atomic fields can be distorted, you see, and Psychic Probes might probe only into static. That's right. I'll take it."

The receiver on the general's desk was glowing and a message capsule clicked into the slot, near which Barr still stood and still held the trimensional Imperial bust.

Riose stepped behind his desk, with his blast-gun held ready. He said to Barr, "You too, patrician. Your wristband condemns you. You have been helpful earlier, however, and I am not vindictive, but I shall judge the fate of your behostaged family by the results of the Psychic Probe."

And as Riose leaned over to take out the message capsule, Barr lifted the crystal-enveloped bust of Cleon and quietly and methodically brought it down upon the general's head.

It happened too suddenly for Devers to grasp. It was as if a sudden demon had grown into the old man.

"Out!" said Barr, in a tooth-clenched whisper. "Quickly!" He seized Riose's dropped blaster and buried it in his blouse.

Sergeant Luk turned as they emerged from the narrowest possible crack of the door.

Barr said easily, "Lead on, sergeant!"

Devers closed the door behind him.

Sergeant Luk led in silence to their quarters, and then, with the briefest pause, continued onward, for there was the nudge of a blast-gun's muzzle in his ribs, and a hard voice in his ears which said, "To the trade ship."

Devers stepped forward to open the air lock, and Barr said, "Stand where you are, Luk. You've been a decent man, and we're not going to kill you."

But the sergeant recognized the monogram on the gun. He cried in choked fury, "You've killed the general."

With a wild, incoherent yell, he charged blindly upon the blasting fury of the gun and collapsed in blasted ruin.

The trade ship was rising above a dead planet before the signal lights began their eerie blink and against the creamy cobweb of the great Lens in the sky which was the Galaxy, other black forms rose.

Devers said grimly, "Hold tight, Barr—and let's see if they've got a ship that can match my speed."

He knew they hadn't!

And once in open space, the trader's voice seemed lost and dead as he said, "The line I fed Brodrig was a little too good. It seems as if he's thrown in with the general."

Swiftly they raced into the depths of the star-mass that was the Galaxy.

VIII.

Devers bent over the little dead globe, watching for a tiny sign of life. The directional control was slowly and thoroughly sieving space with its jabbing tight sheaf of signals.

Barr watched patiently from his seat on the low cot in the corner. He asked, "No more signs of them?"

"The Empire boys? No." The trader growled the words with evident impatience. "We lost the scuppers long ago. Space! With the blind jumps we took through hyperspace, it's lucky we didn't land up in a sun's belly. They couldn't have followed us even if they outranged us, which they didn't."

He sat back and loosened his collar with a jerk. "I don't know what those Empire boys have done here. I think some of the gaps are out of alignment."

"I take it, then, you're trying to to get the Foundation."

"I'm calling the Association—or trying to."

"The Association? Who are they?"

"Association of Independent Traders. Never heard of it, huh? Well, you're not alone. We haven't made our splash yet!"

For a while there was a silence that centered about the unresponsive Reception Indicator, and Barr said, "Are you within range?"

"I don't know. I haven't but a small notion where we are, going by dead reckoning. That's why I have to use directional control. It could take years, you know."

"Might it?"

Barr pointed; and Devers jumped and adjusted his earphones. Within the little murky sphere there was a tiny glowing whiteness.

For half an hour, Devers nursed the fragile, groping thread of communication that reached through hyperspace to connect two points that laggard light would take five hundred years to bind together.

Then he sat back, hopelessly. He looked up, and shoved the earphones back.

"Let's eat, doc. There's a needle-shower you can use if you want to, but go easy on the hot water."

He squatted before one of the cabinets that lined one wall and felt through the contents. "You're not a vegetarian, I hope?"

Barr said, "I'm omnivorous. But what about the Association. Have you lost them?"

"Looks so. It was extreme range, a little too extreme. Doesn't matter, though. I got all that counted."

He straightened, and placed the two metal containers upon the table. "Just give it five minutes, doc, then slit it open by pushing the contact. It'll be plate, food, and fork—sort of handy for when you're in a hurry, if you're not interested in such incidentals as napkins. I suppose you want to know what I got out of the Association."

"If it isn't a secret."

Devers shook his head. "Not to you. What Riose said was true."

"About the offer of tribute?"

"Uh-huh. They offered it, *and* had it refused. Things are bad. There's fighting in the outer suns of Loris."

"Loris is close to the Foundation?"

"Huh? Oh, you wouldn't know. It's one of the original Four Kingdoms. You might call it part of the inner line of defense. That's not the worst. They've been fighting large ships previously never encountered. Which means Riose wasn't giving us the works. He *has* received more ships. Brodrig *has* switched sides, and I *have* messed things up."

His eyes were bleak as he joined the food-container contact-points and watched it fall open neatly. The stewlike dish steamed its aroma through the room. Ducem Barr was already eating.

"So much," said Barr, "for improvisations, then. We can do nothing here; we cannot cut through the Imperial lines to return to the Foundation; we can do nothing but that which is most sensible—to wait patiently. However, if Riose has reached the inner line I trust the wait will not be too long."

And Devers put down his fork. "Wait, is it?" he snarled, glowering. "That's all right for *you*. You've got nothing at stake."

"Haven't I?" Barr smiled thinly.

"No. In fact, I'll tell you." Devers' irritation skimmed the surface. "I'm tired of looking at this whole business as if it were an interesting something-or-other on a microscope slide. I've got friends somewhere out there, dying; and a whole world out there, my home, dying also. You're an outsider. You don't know."

"I have seen friends die." The old man's hands were limp in his lap and his eyes were closed. "Are you married?"

Devers said, "Traders don't marry."

"Well, I have two sons and a nephew. They have been warned, but—for reasons—they could take no action. Our escape means their death. My daughter and my two grandchildren have, I hope, left the planet safely before this, but even excluding them, I have already risked and lost more than you."

Devers was morosely savage. "I know. But that was a matter of choice. You might have played ball with Riose. I never asked you to—"

Barr shook his head. "It was not a matter of choice, Devers. Make your conscience free; I didn't risk my sons for you. I co-operated with Riose as long as I dared. But there was the Psychic Probe."

The Siwennian patrician opened his eyes and they were sharp with pain. "Riose came to me once; it was over a year ago. He spoke of a cult centering about the magicians, but missed the truth. It is not quite a cult. You see, it is forty years now that Siwenna has been gripped in that same unbearable vice that threatens your world. Five revolts have been ground out. Then I discovered the ancient records of Hari Seldon—and now this 'cult' waits.

"It waits for the coming of the 'magicians' and for that day it is ready. My sons are leaders of those who wait. Is is *that* secret which is in my mind and which the Probe must never touch. And so they must die as hostages; for the alternative is their death as rebels and half of Siwenna with them. You see, I had no choice. And I am no outsider."

Devers' eyes fell, and Barr continued softly, "It is on a Foundation victory that Siwenna's hopes depend. It is for a Foundation victory that my sons are sacrificed. And Hari Heldon does not pre-calculate the inevitable salvation of Siwenna as he does that of the Foundation. I have no certainty for *my* people—only hope."

"But you are still satisfied to wait. Even with the Imperial Navy at Loris."

"I would wait, in perfect confidence," said Barr, simply, "if they had landed on the planet, Terminus, itself."

The trader frowned hopelessly. "I don't know. It can't really work like that; not just like magic. Psycho-history or not; they're terribly strong, and we're weak. What can Seldon do about it?"

"There's nothing to *do*. It's all already *done*. It's proceeding now. Because you don't hear the wheels turning and the gongs beating doesn't mean it's any the less certain."

"Maybe; but I wish you had cracked Riose's skull for keeps. He's more the enemy than all his army."

"Cracked his skull? With Brodrig his second in command?" Barr's face sharpened with hate. "All Siwenna would have been my hostage. Brodrig has proven his worth long since. There exists a world which five years ago lost one male in every ten—and simply for failure to meet outstanding taxes. This same Brodrig was the tax-collector. No, Riose may live. His punishments are mercy in comparison."

"But six months, *six months,* in the enemy Base, with nothing to show for it." Devers' strong hands clasped each other tautly, so that his knuckles cracked. "Nothing to show for it!"

"Well, now, wait. You remind me—" Barr fumbled in his pouch. "You might want to count this." And he tossed the small sphere of metal on the table.

Devers snatched it. "What is it?"

"The message capsule. The one that Riose received just before I jacked him. Does that count as something?"

"I don't know. Depends on what's in it!" Devers sat down and turned it over carefully in his hand.

When Barr stepped from his cold shower and, gratefully, into the mild warm current of the air dryer, he found Devers silent and absorbed at the workbench.

The Siwennian slapped his body with a sharp rhythm and spoke above the punctuating sounds. "What are you doing?"

Devers looked up. Droplets of perspiration glittered in his beard. "I'm going to open this capsule."

"Can you open it without Riose's personal characteristic?" There was mild surprise in the Siwennian's voice.

"If I can't, I'll resign from the Association and never skipper a ship for what's left of my life. I've got a three-way electronic analysis of the interior now, and I've got little jiggers that the Empire never heard of, especially made for jimmying capsules. I've been a burglar before this, y'know. A trader has to be something of everything."

He bent low over the little sphere, and a small flat instrument probed delicately and sparked redly at each fleeting contact.

He said, "This capsule is a crude job, anyway. These Imperial boys are no shakes at this small work. I can see that. Ever see a Foundation capsule? It's half the size and impervious to electronic analysis in the first place."

And then he was rigid, the shoulder muscles beneath his tunic tautening visibly. His tiny probe pressed slowly—

It was noiseless when it came, but Devers relaxed and sighed. In his hand was the shining sphere with its message unrolled like a parchment tongue.

"It's from Brodrig," he said. Then, with contempt, "The message medium is permanent. In a Foundation capsule, the message would be oxidized to gas within the minute."

But Ducem Barr waved him silent. He read the message quickly.

FROM: AMMEL BRODRIG, ENVOY EXTRAORDINARY OF HIS IMPERIAL MAJESTY, PRIVY SECRETARY OF THE COUNCIL, AND PEER OF THE REALM.

TO: BEL RIOSE, MILITARY GOVERNOR OF SIWENNA, GENERAL OF THE IMPERIAL FORCES, AND PEER OF THE REALM.

I GREET YOU.

PLANET #1120 NO LONGER RESISTS. THE PLANS OF OFFENSE AS OUTLINED CONTINUE SMOOTHLY. THE ENEMY WEAKENS VISIBLY AND THE ULTIMATE ENDS IN VIEW WILL SURELY BE GAINED.

Barr raised his head from the almost microscopic print and cried bitterly, "The fool! The forsaken, blasted fop! *That* a message?"

"Huh?" said Devers. He was vaguely disappointed.

"It says nothing," ground out Barr. "Our lick-spittle courtier is playing at general now. With Riose away, he is the field commander and must soothe his paltry spirit by spewing out his pompous reports concerning military affairs he has nothing to do with. 'So-and-so planet no longer resists.' 'The offensive moves on.' 'The enemy weakens.' The vacuum-headed peacock."

"Well, now, wait a minute. Hold on—"

"Throw it away." The old man turned away in mortification. "The Galaxy knows I never expected it to be world-shakingly important, but in wartime it is reasonable to assume that even the most routine order left undelivered might hamper military movements and lead to complications later. It's why I snatched it. But this! Better to have left it. It would have wasted a minute of Riose's time that will now be put to more constructive use."

But Devers had arisen. "Will you hold on and stop throwing your weight around? For Seldon's sake—"

He held out the sliver of message before Barr's nose. "Now read that again. What does he mean by 'ultimate ends in view'?"

"The conquest of the Foundation. Well?"

"Yes? And maybe he means the conquest of the Empire. You know he *believes* that to be the ultimate end."

"And if he does?"

"If he does!" Devers' one-sided smile was lost in his beard. "Why, watch then, and I'll show you."

With one finger the lavishly monogrammed sheet of message-parchment was thrust back into its slot. With a soft twang, it disappeared and the globe was a smooth, unbroken whole again. Somewhere inside was the tiny oiled whir of the controls as they lost their setting by random movements.

"Now there is no known way of opening this capsule without knowledge of Riose's personal characteristics, is there?"

"To the Empire, no," said Barr.

"Then the evidence it contains is unknown to us and absolutely authentic."

"To the Empire, yes," said Barr.

"And the Emperor *can* open it, can't he? Personal Characteristics of Government officials must be on file. They are at the Foundation."

"At the Imperial capital as well," agreed Barr.

"Then when you, a Siwennian patrician and Peer of the Realm, tell this Cleon, this Emperor, that his favorite tame-parrot and his shiniest general are getting together to knock him over, and hand him the capsule as evidence, what will *he* think Brodrig's 'ultimate ends' are?"

Barr sat down weakly. "Wait, I don't follow you." He stroked one thin cheek, and said, "You're not really serious, are you?"

"I am." Devers was angrily excited. "Listen, nine out of the last ten Emperors got their throats cut, or their gizzards blasted out by one or another of their generals with big-time notions in their heads. You told me that yourself more than once. Old man Emperor would believe us so fast it would make Riose's head swim."

Barr muttered feebly, "He *is* serious. For the Galaxy's sake, man, you can't beat a Seldon crisis by a far-fetched, impractical, storybook scheme like that. Suppose you had never got hold of the capsule. Suppose Brodrig hadn't used the word 'ultimate.' Seldon doesn't depend on wild luck."

"If wild luck comes our way, there's no law says Seldon can't take advantage of it."

"Certainly. But . . . but," Barr stopped, then spoke calmly but with visible restraint. "Look, in the first place, how will you get to the planet Trantor. You don't know its location in space, and I certainly don't remember the co-ordinates, to say nothing of the ephemerae. You don't even know your own position in space."

"You can't get lost in space," grinned Devers. He was at the controls already. "Down we go to the nearest planet, and back we come with complete bearings and the best navigation charts Brodrig's hundred thousand smackers can buy."

"*And* a blaster in our belly. Our descriptions are probably in every planet in this quarter of the Empire."

"Doc," said Devers, patiently, "don't be a hick from the sticks. Riose said my ship surrendered too easily and, brother, he wasn't kidding. This ship has enough firepower and enough juice in its shield to hold off anything we're likely to meet this deep inside the frontier. And we have personal shields, too. The Empire boys never found them, you know, but they weren't meant to be found."

"All right," said Barr, "all right. Suppose yourself on Trantor. How do you see the Emperor then? You think he keeps office hours?"

"Suppose we worry about that on Trantor," said Devers.

And Barr muttered helplessly, "All right again. I've wanted to see Trantor before I die for half a century now. Have your way."

The hyperatomic motor was cut in. The lights flickered and there was the slight internal wrench that marked the shift into hyperspace.

IX.

The stars were as thick as weeds in an unkempt field, and for the first time, Lathan Devers found the figures to the right of the decimal point of prime importance in calculating the cuts through the hyperregions. There was a claustrophobic sensation about the necessity for leaps of not more than a light-year. There was a frightening harshness about a sky which glittered unbrokenly in every direction. It was being lost in a sea of radiation.

And in the center of a cluster of ten thousand stars, whose light tore to shreds the feebly encircling darkness, there circled the huge Imperial planet, Trantor.

But it was more than a planet; it was the living pulse beat of an Empire of twenty million stellar systems. It had only one function, administration; one purpose, government; and one manufactured product, law.

The entire world was one functional distortion. There was no living object on its surface but man, his pets, and his parasites. No blade of grass or fragment of uncovered soil could be found outside the hundred square miles of the Imperial Palace. No water outside the Palace grounds existed but in the vast underground cisterns that held the water supply of a world.

The lustrous, indestructible, incorruptible metal that was the unbroken surface of the planet was the foundation of the huge, metal structures that mazed the planet. They were structures connected by causeways; laced by corridors; cubbyholed by offices; basemented by the huge retail centers that covered square miles; penthoused by the glittering amusement world that sparkled into life each night.

One could walk around the world of Trantor and never leave that one conglomerate building, nor see the city.

A fleet of ships greater in number than all the war fleets the Empire had ever supported landed their cargoes on Trantor each day to feed the forty billions of humans who gave nothing in exchange but the fulfillment of the necessity of untangling the myriads of threads that spiraled into the central administration of the most complex government Humanity had ever known.

Twenty agricultural worlds were the granary of Trantor. A universe was its servant—

Tightly held by the huge metal arms on either side, the trade ship was gently lowered down the huge ramp that led to the hangar. Already Devers had fumed his way through the manifold complications of a world conceived in paper work and dedicated to the principle of the form-in-quadruplicate.

There had been the preliminary halt in space, where the first of what had grown into a hundred questionnaires had been filled out. There were the hundred cross-examinations, the routine administration of a simple Probe, the photographing of the ship, the Characteristic-Analysis of the two men, and the subsequent recording of the same, the search for contraband, the payment of the entry tax—and finally the question of the identity cards and visitor's visa.

Ducem Barr was a Siwennian and subject of the Emperor, but Lathan Devers was an unknown without the requisite documents. The official in charge at the moment was devastated with sorrow, but Devers could not enter. In fact, he would have to be held for official investigation.

From somewhere a hundred credits in crisp, new bills backed by the estates of Lord Brodrig made their appearance, and changed hands quietly. The official hemmed importantly and the devastation of his sorrow was assuaged. A new form made its appearance from the appropriate pigeonhole. It was filled out rapidly and efficiently, with the Devers characteristic thereto formally and properly attached.

The two men, trader and patrician, entered Siwenna.

In the hangar, the trade ship was another vessel to be cached, photographed, recorded, contents noted, identity cards of passengers facsimiled, and for which a suitable fee was paid, recorded, and receipted.

And then Devers was on a huge terrace under the bright white sun, along which women chattered, children shrieked, and men sipped drinks languidly and listened to the huge televisors blaring out the news of the Empire.

Barr paid a requisite number of iridium coins and appropriated the uppermost member of a pile of newspapers. It was the Trantor *Imperial News,* official organ of the government. In the back of the news room, there was the soft clicking noise of additional editions being printed in long-distance sympathy with the busy machines at the *Imperial News* offices ten thousand miles away by corridor—six thousand by air-machine—just as ten million sets of copies were being likewise printed at that moment in ten million other news rooms all over the planet.

Barr glanced at the headlines and said softly, "What shall we do first?"

Devers tried to shake himself out of his depression. He was in a universe far removed from his own, on a world that weighed him down with its intricacy, among people whose doings were incomprehensible and whose language was nearly so. The gleaming metallic towers that surrounded him and continued onwards in never-ending multiplicity to beyond the horizon oppressed him; the whole busy, unheeding life of a world-metropolis cast him into the horrible gloom of isolation and pygmyish unimportance.

He said, "I better leave it to you, doc."

Barr was calm, low-voiced. "I tried to tell you, but it's hard to believe without seeing for yourself, I know that. "Do you know how many people want to see the Emperor every day? About one million. Do you know how many he sees? About ten. We'll have to work through the civil service, and that makes it harder. But we can't afford the aristocracy."

"We have almost one hundred thousand."

"A single Peer of the Realm would cost us that, and it would take at least three or four to form an adequate bridge to the Emperor. It may take fifty chief commissioners and senior supervisors to do the same, but they would cost us only a hundred apiece perhaps. I'll do the talking. In the first place, they wouldn't understand your accent, and in the second, you don't know the etiquette of Imperial bribery. It's an art, I assure you. Ah!"

The third page of the *Imperial News* had what he wanted and he passed the paper to Devers.

Devers read slowly. The vocabulary was strange, but he understood. He looked up, and his eyes were dark with concern. He slapped the news sheet angrily with the back of his hand. "You think this can be trusted?"

"Within limits," replied Barr, calmly. "It's highly improbable that the Foundation fleet was wiped out. They've probably reported *that* several times already, if they've gone by the usual war-reporting technique of a world capital far from the actual scene of fighting.

What it means, though, is that Riose has won another battle, which would be none-too-unexpected. It says he's captured Loris. Is that the capital planet of the Kingdom of Loris?"

"Yes," brooded Devers, "or of what used to be the Kingdom of Loris. And it's not twenty parsecs from the Foundation. Doc, we've got to work fast."

Barr shrugged. "You can't go fast on Trantor. If you try, you'll end up at the point of atom-blaster, most likely."

"How long will it take?"

"A month, if we're lucky. A month, and our hundred thousand credits—if even that will suffice. And that is providing the Emperor does not take it into his head in the meantime to travel to the Summer Planets, where he sees no petitioners at all."

"But the Foundation—"

"—Will take care of itself, as heretofore. Come, there's the question of dinner. I'm hungry. And afterwards, the evening is ours and we may as well use it. We shall never see Trantor or any world like it again, you know."

The Home Commissioner of the Outer Provinces spread his pudgy hands helplessly and peered at the petitioners with owlish nearsightedness. "But the Emperor is indisposed, gentlemen. It is really useless to take the matter to my superior. His Imperial Majesty has seen no one in a week."

"He will see us," said Barr, with an affectation of confidence. "It is but a question of seeing a member of the staff of the Privy Secretary."

"Impossible," said the commissioner, emphatically. "It would be the worth of my job to attempt that. Now if you could but be more explicit concerning the nature of your business. I'm willing to help you, understand, but naturally I want something less vague, something I can present to my superior as reason for taking the matter further."

"If my business were such that it could be told to any but the highest," suggested Barr, smoothly, "it would scarcely be important enough to rate audience with His Imperial Majesty. I propose that you take a chance. I might remind you that if His Imperial Majesty attaches the importance to our business which we guarantee that he will, you will stand certain to receive the honors you will deserve for helping us now."

"Yes, but—" and the commissioner shrugged, wordlessly.

"It's a chance," agreed Barr. "Naturally, a risk should have its compensation. It is a rather great favor to ask you, but we have already been greatly obliged with your kindness in offering us this opportunity to explain our problem. But if you would *allow* us to express our gratitude just slightly by—"

Devers scowled. He had heard this speech with its slight variations twenty times in the past month. It ended, as always, in a quick shift of the half-hidden bills.

But the epilogue differed here. Usually the bills vanished immediately; here they remained in plain view, while slowly the commissioner counted them, inspecting them front and back as he did so.

There was a subtle change in his voice. "Backed by the Privy Secretary, hey? Good money!"

"To get back to the subject—" urged Barr.

"No, but wait," interrupted the commissioner, "let us go back by easy stages. I really do wish to know what your business can be. This money, it is fresh and new, and you must have a good deal, for it strikes me that you have seen other officials before me. Come, now, what about it?"

Barr said, "I don't see what you are driving at."

"Why, see here, it might be proven that you are upon the planet illegally, since the Identification and Entry Cards of your silent friend are certainly inadequate. He is not a subject of the Emperor."

"I deny that."

"It doesn't matter that you do," said the commissioner, with sudden bluntness. "The official who signed his Cards for the sum of a hundred credits has confessed—under pressure—and we know more of you than you think."

"If you are hinting, sire, that the sum we have asked you to accept is inadequate in view of the risks—"

The commissioner smiled. "On the contrary, it is more than adequate." He tossed the bills aside. "To return to what I was saying, it is the Emperor himself who has become interested in your case. Is it not true, sirs, that you have recently been guests of General Riose? Is it not true that you have escaped from the midst of his army with, to put it mildly, astonishing ease? Is it not true that you possess a small fortune in bills backed by Lord Brodrig's estates? In short, is it not true that you are a pair of spies and assassins sent here to— Well, you shall tell us yourself who paid you and for what?"

"Do you know," said Barr, with silky anger, "I deny the right of a petty commissioner to accuse us of crimes. We will leave."

"You will not leave." The commissioner arose, and his eyes no longer seemed near-sighted. "You need answer no question now; that will be reserved for a later—and more forceful—time. Nor am I a commissioner; I am a Lieutenant of the Imperial Police. You are under arrest."

There was a glitteringly efficient blast-gun in his fist as he smiled. "There are greater men than you under arrest this day. It is a hornet's nest we are cleaning up."

Devers snarled and reached slowly for his own gun. The lieutenant of police smiled more broadly and squeezed the contacts. The blasting line of force struck Devers' chest in an accurate blaze of destruction—that bounced harmlessly off his personal shield in sparkling spicules of light.

Devers shot in turn, and the lieutenant's head fell from off an upper torso that had disappeared. It was still smiling as it lay in the jag of sunshine which entered through the new-made hole in the wall.

It was through the back entrance that they left.

Devers said huskily, "Quickly to the ship. They'll have the alarm out in no time." He cursed in a ferocious whisper. "It's another plan that's backfired. I could swear the space fiend himself is against me."

It was in the open that they became aware of the jabbering crowds that surrounded the huge televisors. They had no time to wait; the disconnected roaring words that reached them, they disregarded. But Barr snatched a copy of the *Imperial News* before diving into the huge barn of the hangar, where the ship lifted hastily through a giant cavity burnt fiercely into the roof.

"Can you get away from them?" asked Barr.

Ten ships of the traffic-police wildly followed the runaway craft that had burst out of the lawful, radio-beamed Path of Leaving, and then broken every speed law in creation. Further behind still, sleek vessels of the Secret Service were lifting in pursuit of a carefully described ship manned by two thoroughly identified murderers.

"Watch me," said Devers, and savagely shifted into hyperspace two thousand miles above the surface of Trantor. The shift, so near a planetary mass, meant unconsciousness for Barr and a fearful haze of pain for Devers, but light-years further, space about them was clear.

Devers' somber pride in his ship burst to the surface. He said, "There's not an Imperial ship that could follow me anywhere."

And then, bitterly, "But there is nowhere left to run to for us, and we can't fight their weight. What's there to do? What can anyone do?"

Barr moved feebly on his cot. The effect of the hyper-shift had not yet worn off, and each of his muscles ached. He said, "No one has to do anything. It's all over. Here!"

He passed the copy of the *Imperial News* that he still clutched, and the headlines were enough for the trader.

"Recalled and arrested—Riose and Brodrig," Devers muttered. He stared blankly at Barr. "Why?"

"The story doesn't say, but what does it matter? The war with the Foundation is over, and at this moment, Siwenna is revolting. Read the story and see." His voice was drifting off. "We'll stop in some of the provinces and find out the later details. If you don't mind, I'll go to sleep now."

And he did.

In grasshopper jumps of increasing magnitude, the trade ship was spanning the Galaxy in its return to the Foundation.

X.

Lathan Devers felt definitely uncomfortable, and vaguely resentful. He had received his own decoration and withstood with mute stoicism the turgid oratory of the mayor which accompanied the slip of crimson ribbon. That had ended his share of the ceremonies, but, naturally, formality forced him to remain. And it was formality, chiefly—the type that couldn't allow him to yawn noisily or to swing a foot comfortably onto a chair seat—that made him long to be in space, where he belonged.

The Siwennese delegation, with Ducem Barr a lionized member, signed the Convention, and Siwenna became the first province to pass directly from the Empire's political rule to the Foundation's economic one.

Five Imperial Ships of the Line—captured when Siwenna rebelled behind the lines of the Empire's Border Fleet—flashed overhead, huge and massive, detonating a roaring salute as they passed over the city.

Nothing but drinking, etiquette, and small talk now—

A voice called him. It was Forell; the man who, Devers realized coldly, could buy twenty of him with a morning's profits—but a Forell who now crooked a finger at him with genial condescension.

He stepped out upon the balcony into the cool night wind, and bowed properly, while scowling into his bristling beard.

Barr was there, too; smiling. He said, "Devers, you'll have to come to my rescue. I'm being accused of modesty, a horrible and thoroughly unnatural crime."

"Devers," Forell removed the fat cigar from the side of his mouth when he spoke, "Lord Barr claims that your trip to Cleon's capital had nothing to do with the recall of Riose."

"Nothing at all, sir." Devers was curt. "We never saw the Emperor. The reports we picked up on our way back concerning the trial, showed it up to be the purest frame-up. There was a mess of a rigamarole about the general being tied up with subversive interests at the court."

"And he was innocent?"

"Riose?" interposed Barr. "Yes! By the Galaxy, yes. Brodrig was a traitor on general principles but was never guilty of the specific accusations brought against him. It was a judicial farce; but a necessary one, a predictable one, an inevitable one."

"By psycho-historical necessity, I presume." Forell rolled the phrase sonorously with the humorous ease of long familiarity.

"Exactly." Barr grew serious. "It never penetrated earlier, but once it was over and I could . . . well . . . look at the answers in the back of the book, the problem became simple. We can see, *now,* that the social background of the Empire makes wars of conquest impossible for it. Under weak Emperors, it is torn apart by generals competing for a worthless and surely death-bringing throne. Under strong Emperors, the Empire is frozen into a paralytic rigor in which disintegration apparently ceases for the moment, but only at the sacrifice of all possible growth."

Forell growled bluntly through strong puffs, "You're not clear, Lord Barr."

Barr smiled slowly. "Mm, I suppose so. It's the difficulty of not being trained in psycho-history. Words are a pretty fuzzy substitute for mathematical equations. But let's see now—"

Barr considered, while Forell relaxed, back to railing, and Devers looked into the velvet sky and thought wonderingly of Trantor.

Then Barr said, "You see, sir, you—and Devers—and everyone no doubt, had the idea that beating the Empire meant first prying apart the Emperor and his general. You, and Devers, and everyone else were right—right all the time, as far as the principle of internal disunion was concerned.

"You were wrong, however, in thinking that this internal split was something to be brought about by individual acts, by inspirations of the moment. You tried bribery and lies. You appealed to ambition and to fear. But you got nothing for all your pains. In fact, appearances were worse after each attempt.

"And through all this wild threshing up of tiny ripples, the Seldon tidal wave continued onward, quietly—but quite irresistibly."

Ducem Barr turned away, and looked over the railing at the lights of a rejoicing city. He said, "There was a dead hand pushing all of us; the mighty general and the great Emperor; my world and your world—the dead hand of Hari Seldon. He knew that a man like Riose would have to fail, since it was his success that brought failure; and the greater the success, the surer the failure."

Forell said dryly, "I can't say you're getting clearer."

"A moment," continued Barr earnestly. "Look at the situation. A weak general could never have endangered us, obviously. A strong general during the time of a weak Emperor would never have endangered us, either; for he would have turned his arms towards a much more fruitful target. Events have shown that three-fourths of the Emperors of the last two centuries were rebel generals and rebel viceroys before they were Emperors.

"So it is only the combination of strong Emperor *and* strong general that can harm the Foundation; for a strong Emperor cannot be dethroned easily, and a strong general is forced to turn outwards, past the frontiers.

"But, what keeps the Emperor strong? What kept Cleon strong? It's obvious. He is strong, because he permits no strong subjects. A courtier who becomes too rich, or

a general who becomes too popular is dangerous. All the recent history of the Empire proves that to any Emperor intelligent enough to be strong.

"Riose won victories, so the Emperor grew suspicious. All the atmosphere of the times forced him to be suspicious. Did Riose refuse a bribe? Very suspicious; ulterior motives. Did his most trusted courtier suddenly favor Riose. Very suspicious; ulterior motives. It wasn't the individual acts that were suspicious. Anything else would have done—which is why our individual plots were unnecessary and rather futile. It was the *success* of Riose that was suspicious. So he was recalled, and accused, condemned, murdered. The Foundation wins again.

"Why, look, there is not a conceivable combination of events that does not result in the Foundation winning. It was inevitable; whatever Riose did, whatever we did."

The Foundation magnate nodded ponderously, "So! But what if the Emperor and the general had been the same person. Hey? What then? That's a case you didn't cover, so you haven't proved your point yet."

Barr shrugged, "I can't *prove* anything; I haven't the mathematics. But I appeal to your reason. With an Empire in which every aristocrat, every strong man, every pirate can aspire to the Throne—and, as history shows, often successfully—what would happen to even a strong Emperor who preoccupied himself with foreign wars at the extreme end of the Galaxy? How long would he have to remain away from the capital before somebody raised the standards of civil war and forced him home. The social environment of the Empire would make that time short.

"I once told Riose that not all the Empire's strength could swerve the dead hand of Hari Seldon."

"Good! Good!" Forell was expansively pleased. "Then you imply the Empire can never threaten us again."

"It seems to me so," agreed Barr. "Frankly, Cleon may not live out the year, and there's going to be a disputed succession almost as a matter of course, which might mean the *last* civil war for the Empire."

"Then," said Forell, "there are no more enemies."

Barr was thoughtful. "There's the Second Foundation."

"At the other end of the Galaxy? Not for centuries."

Devers turned suddenly at this, and his face was dark as he faced Forell. "There are internal enemies, perhaps."

"Are there?" asked Forell, coolly. "Who, for instance?"

"People, for instance, who might like to spread the wealth a bit, and keep it from concentrating too much *out* of the hands that work for it. See what I mean?"

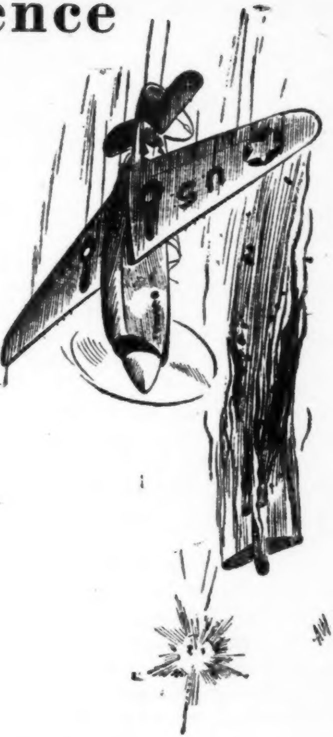
Slowly, Forell's gaze lost its contempt and grew one with the anger of Devers' own.

THE END.

Correspondence Course

by RAYMOND F. JONES

Quite a course it was, too . . . learn by mail how to service the atomic drives of an interstellar spaceship. Only one thing wrong: men hadn't invented those techniques!



Illustrated by Williams

The old lane from the farmhouse to the letter box down by the road was the same dusty trail that he remembered from eons before. The deep summer dust stirrtd as his feet moved slowly and haltingly. The marks of his left foot were deep and firm as when he had last walked the lane, but where his right foot moved there was a ragged, continuous line with irregular depressions and there was the sharp imprint of a cane beside the dragging footprints.

He looked up to the sky a moment as an echelon of planes from the advanced trainer base fifty miles away wheeled overhead. A nostalgia seized him, an overwhelming longing for the men he had known—and for Ruth.

He was home; he had come back

alive, but with so many gone who would never come back, what good was it?

With Ruth gone it was no good at all. For an instant his mind burned with pain and his eyes ached as if a bomb-burst had blinded him as he remembered that day in the little field hospital where he had watched her die and heard the enemy planes overhead.

Afterwards, he had gone up alone, against orders, determined to die with her, but take along as many Nazis as he could.

But he hadn't died. He had come out of it with a bullet-shattered leg and sent home to rust and die slowly over many years.

He shook his head and tried to fling the thoughts out of his mind. It was wrong. The doctors had warned him—

He resumed his slow march, half dragging the all but useless leg behind him. This was the same lane down which he had run so fast those summer days so long ago. There was a swimming hole and a fishing pond a quarter of a mile away. He tried to dim his vision with half-shut eyes and remember those pleasant days and wipe out all fear and bitterness from his mind.

It was ten o'clock in the morning and Mr. McAfee, the rural postman, was late, but Jim Ward could see his struggling, antique Ford raising a low cloud of dust a mile down the road.

Jim leaned heavily upon the stout cedar post that supported the mailbox and when Mr. McAfee rattled up he managed to wave and smile cheerily.

Mr. McAfee adjusted his spectacles on the bridge of his nose with a rapid trombone manipulation.

"Bless me, Jim, it's good to see you up and around!"

"Pretty good to be up." Jim managed to force enthusiasm into his voice. But he knew he couldn't stand talking very long to old Charles McAfee as if everything had not changed since the last time.

"Any mail for the Wards, today?"

The postman shuffled the fistful of mail. "Only one."

Jim glanced at the return address block and shrugged. "I'm on the sucker lists already. They don't lose any time when they find out there's still bones left to pick on. You keep it."

He turned painfully and faced towards the house. "I've got to be getting back. Glad to have seen you, Mr. McAfee."

"Yeah, sure, Jim. Glad to have seen you. But I . . . er . . . got to deliver the mail—" He held the letter out hopefully.

"O.K." Jim laughed sharply and grasped the circular.

He went only as far as the giant oak whose branches extended far enough to overshadow the mailbox. He sat down in the shade with his back against the great bole and tried to watch the echelon still soaring above the valley through the rifts in the leaf coverage above him.

After a time he glanced down at the circular letter from which his fingers were peeling little fragments of paper. Idly, he ripped open the envelope and glanced at the contents. In cheap, garish typograph with splatterings of red and purple ink the words seemed to be trying to jump at him.

SERVICEMAN—WHAT OF THE FUTURE?

You have come back from the wars. You have found life different than you knew it before, and much that was familiar is gone. But new things have come, new things that are here to stay and are a part of the world you are going to live in.

Have you thought of the place you will occupy? Are you prepared to resume life in the ways of peace?

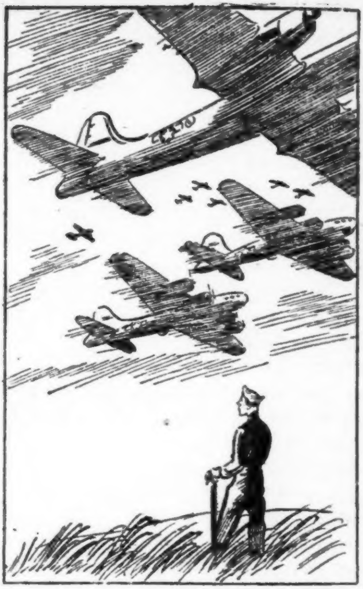
WE CAN HELP YOU

Have you heard of the POWER CO-ORDINATOR? No, of course you haven't because it has been a hush-hush secret source of power that has been turning the wheels of war industries for many months. But now the secret of this vast source of new power can be told, and the need for hundreds, yes, thousands of trained technicians—such as you, yourself, may become—will be tremendous in the next decade.

LET US PROVE TO YOU

Let us prove to you that we know what we are talking about. We are so certain that you, as a soldier trained in intricate operations of the machines of war, will be interested in this almost miraculous new source of power and the technique of handling it that we are willing to send you absolutely FREE the first three lessons of our twenty-five lesson course that will train you to be a POWER CO-ORDINATOR technician.

Let us prove it to you. Fill out the inclosed coupon and mail it today!



Don't just shrug and throw this circular away as just another advertisement. MAIL THE COUPON NOW!

Jim Ward smiled reminiscently at the style of the circular. It reminded him of Billy Hensley and the time when they were thirteen. They sent in all the clipped and filled-out coupons they could find in magazines. They had samples of soap and magic tricks and catalogues and even a live bird came as the result of one. They kept all the stuff in Hensley's attic until Billy's dad finally threw it all out.

Impulsively, in whimsical tribute to the gone-forever happiness of those days, Jim Ward scratched his name and address in pencil and told the power co-ordinators to send him their three free lessons.

Mr. McAfee had only another mile to go up the road before he came to the end and returned past the Ward farm to Kramer's Forks. Jim waited and hailed him.

"Want to take another letter?"

The postman halted the clattering Ford and jumped down. "What's that?"

Jim repeated his request and held up the stamped reply card. "Take this with you?"

Mr. McAfee turned it over and read every word on the back of the card. "Good thing," he grunted. "So you're going to take a correspondence course in this new power what-is-it? I think that's mighty fine, Jim. Give you new interests—sort of take your mind off things."

"Yeah, sure." Jim struggled up with the aid of his cane and the bole of the oak tree. "Better see if I can make it back to the house now."

All the whimsy and humor had suddenly gone out of the situation.

It was a fantastically short time—three days later—that Mr. McAfee stopped again at the Ward farm. He glanced at the thick envelope in his pack and the return address block it bore. He could see Jim Ward on the farmhouse porch and turned the Ford up the lane.

Its rattle made Jim turn his head and open his eyes from the thoughtless blankness into which he had been trying to sink. He removed the pipe from his mouth and watched the car approach.

"Here's your course," shouted Mr. McAfee. "Here's your first lesson!"

"What lesson?"

"The correspondence course you sent for. The power what-is-it? Don't you remember?"

"No," said Jim. "I'd forgotten all about it. Take the thing away. I don't want it. It was just a silly joke."

"You hadn't ought to feel that way, Jim. After all, your leg is going to be all right. I heard the Doc say so down in the drug store last night. And everything is going to be all right. There's no use of letting it get you down. Besides—I got to deliver the mail."

He tossed the brown envelope on the porch beside Jim. "Brought it up special because I thought you'd be in a hurry to get it."

Jim smiled in apology. "I'm sorry, Mac. Didn't mean to take it out on you. Thanks for bringing it up. I'll study it good and hard this morning right here on the porch."

Mr. McAfee beamed and nodded and rattled away. Jim closed his eyes again, but he couldn't find the pleasing blankness he'd found before. Now the screen of his mind showed only the sky with thundering, plummeting engines—and the face of a girl lying still and white with closed eyes.

Jim opened his eyes and his hands slipped to his sides and touched the envelope. He ripped it open and scanned the pages. It was the sort of stuff he had collected as a boy, all right. He glanced at the paragraph headings and tossed the first lesson aside. A lot of obvious stuff about comparisons between steam power and waterfalls and electricity. It seemed all jumbled up like a high school student's essay on the development of power from the time of Archimedes.

The mimeographed pages were poorly done. They looked as if the stencils had been cut on a typewriter that had been hit on the type faces with a hammer.

He tossed the second lesson aside and glanced at the top sheet of the third. His hand arrested itself midway in the act of tossing this lesson beside the other two. He caught a glimpse of the calculations on an inside page and opened up the booklet.

There was no high school stuff there. His brain struggled to remember the long unused methods of the integral calculus and the manipulation of partial differential equations.

There were pages of the stuff. It was like a sort of beacon light, dim and far off, but pointing a sure pathway to his mind and getting brighter as he progressed. One by one, he followed the intricate steps of the math and the short paragraphs of description between. When at last he reached the final page and turned the book over and scowled heavily the sun was halfway down the afternoon sky.

He looked away over the fields and pondered. This was no elementary stuff. Such math as this didn't belong in a home study correspondence course. He picked up the envelope and concentrated on the return address block.

All it said was: M. H. Quilcon Schools, Henderson, Iowa. The lessons were signed at the bottom with the mimeographed reproductions of M. H. Quilcon's ponderous signature.

Jim picked up lesson one again and began reading slowly and carefully, as if hidden between the lines he might find some mystic message.

By the end of July his leg was strong enough for him to walk without the cane. He walked slowly and with a limp and once in a while the leg gave way as if he had a trick knee. But he learned quickly to catch himself before he fell and he reveled in the thrill of walking again.

By the end of July the tenth lesson of the correspondence course had arrived and Jim knew that he had gone as far as he could alone. He was lost in amazement as he moved in the new scientific wonderland that opened up before him. He had known that great strides had been made in techniques and production, but it seemed incredible that such a basic discovery as power co-ordination had been producing war machines these many months. He wondered why the principle had not been applied more directly as a weapon itself—but he didn't understand enough about it to know whether it could or not. He didn't even understand yet from where the basic energy of the system was derived.

The tenth lesson was as poorly produced as the rest of them had been, but it was practically a book in its thickness. When he had finished it Jim knew that he had to know more of the background of the new science. He had to talk to someone who knew something about it. But he knew of no one who had ever heard of it. He had seen no advertisements of the M. H. Quilcon Schools. Only that first circular and these lessons.

As soon as he had finished the homework on lesson ten and had given it into Mr. McAfee's care Jim Ward made up his mind to go down to Henderson, Iowa, and visit the Quilcon School.

He wished he had retained the lesson material because he could have taken it there faster than it would arrive via the local mail channels.

The streamliner barely stopped at Henderson, Iowa, long enough to allow him to disembark. Then it was gone and Jim Ward stared about him.

The sleepy looking ticket seller, dispatcher, and janitor eyed him wonderingly and spat a huge amber stream across his desk and out the window.

"Looking for somebody, mister?"

"I'm looking for Henderson, Iowa. Is this it?" Jim asked dubiously.

"You're here, mister. But don't walk too fast or you'll be out of it. The city limits only go a block past Smith's Drugstore."

Jim noticed the sign over the door and glanced at the inscription that he had not seen before: Henderson, Iowa, Pop. 806.

"I'm loking for a Mr. M. H. Quilcon. He runs a correspondence school here somewhere. Do you know of him?"

The depot staff shifted its cud again and spat thoughtfully. "Been here twenty-nine years next October. Never heard a name like that around here, and I know 'em all."

"Are there any correspondence schools here?"

"Miss Marybell Anne - Simmons gives beauty operator lessons once in a while, but that's all the school of that kind that I know of."

Disconcerted. Jim Ward murmured his thanks and moved slowly out of the station. The sight before him was dismaying. He wondered if the population hadn't declined since the estimate on the sign in the station was made.

A small mercantile store that sagged in the middle faced him from across the street. Farther along was a tiny frame building labeled Sheriff's Office. On his side Jim saw Smith's Drugstore a couple of hundred feet down from the station with a riding saddle and a patented fertilizer displayed in the window. In the other direction was the combined postoffice, bank and what was advertised as a newspaper and printing office.

Jim strode towards this last building while curious watchers on the porch of the mercantile store stared at him trudging through the dust.

The postmistress glanced up from the armful of mail that she was sorting into boxes as Jim entered. She offered a cheery hello that seemed to tinkle from the buxom figure.

"I'm looking for a man named Quilcon. I thought you might be able to give me some information concerning him."

"Kweelcon?" She furrowed her brow. "There's no one here by that name. How do you spell it?"

Before he could answer, the woman dropped a handful of letters on the floor. Jim was certain that he saw the one he had mailed to the school before he left.

As the woman stooped to recover the letters a dark brown shadow streaked across the floor. Jim got the momentary impression of an enormous brown slug moving with lightning speed.

The postmistress gave a scream of anger and scuffled her feet to the door. She returned in a moment.

"Armadillo," she explained. "Darn thing's been hanging around here for months and nobody seems to be able to kill it." She resumed putting the mail in the boxes.

"I think you missed one," said Jim. She did not have the one that he recognized as the one he'd mailed.

The woman looked about her on the floor. "I got them all, thank you. Now what did you say this man's name was?"

Jim leaned over the counter and looked at the floor. He was sure—But there was obviously no other letter in sight and there was no place it could have gone.

"Quilcon," said Jim slowly. "I'm not sure of the pronunciation myself, but that's the way it seemed it should be."

"There's no one in Henderson by that name. Wait a minute now. That's a funny thing—you know it was about a month ago that I saw an envelope going out of here with a name something like that in the upper left corner. I thought at the time it was a funny name and wondered who put it in, but I never did find out and I thought I'd been dreaming. How'd you know to come here looking for him?"

"I guess I must have received the mail you saw."

"Well, you might ask Mr. Herald. He's in the newspaper office next door. But I'm sure there's no one in this town by that name."

"You publish a newspaper here?"

The woman laughed. "We call it that. Mr. Herald owns the bank and a big farm and puts this out free as a hobby. It's not much, but everybody in town reads it. On Saturday he puts out a regular printed edition. This is the daily."

She held up a small mimeographed sheet that was moderately legible. Jim glanced at it and moved towards the door. "Thanks, anyway."

As he went out into the summer sun there was something knawing at his brain, an intense you-forgot-something-in-there sort of feeling. He couldn't place it and tried to ignore it.

Then as he stepped across the threshold of the printing office he got it. That mimeographed newssheet he had seen—it bore a startling resemblance to the lessons he had received from M. H. Quilcon. The same purple ink. Slightly crooked sheets. But that was foolish to try to make a connection there. All mimeographed jobs looked about alike.

Mr. Herald was a portly little man with a fringe around his baldness. Jim repeated his inquiry.

"Quilcon?" Mr. Herald pinched his lips thoughtfully. "No, can't say as I ever heard the name. Odd name—I'm sure I'd know it if I'd ever heard it."

Jim Ward knew that further investigation here would be a waste of time. There was something wrong somewhere. The information in his correspondence course could not be coming out of this half dead little town.

He glanced at a copy of the newssheet lying on the man's littered desk beside an ancient Woodstock. "Nice little sheet you put out there," said Jim.

Mr. Herald laughed. "Well, it's not much, but I get a kick out of it, and the people enjoy reading about Mrs. Kelly's lost hogs and the Dorius kid's whooping cough. It livens things up."

"Ever do any work for anybody else—printing or mimeographing?"

"If anybody wants it, but I haven't had an outside customer in three years."

Jim glanced about searchingly. The old Woodstock seemed to be the only typewriter in the room.

"I might as well go on," he said. "But I wonder if you'd mind letting me use your typewriter to write a note and leave in the postoffice for Quilcon if he ever shows up."

"Sure, go ahead. Help yourself."

Jim sat down before the clanking machine and hammered out a brief paragraph while Mr. Herald wandered to the back of the shop. Then Jim rose and shoved the paper in his pocket. He wished he had brought a sheet from one of the lessons with him.

"Thanks," he called to Mr. Herald. He picked up a copy of the latest edition of the newspaper and shoved it in his pocket with the typed sheet.

On the trip homeward he studied the mimeographed sheet until he had memorized every line, but he withheld conclusions until he reached home.

From the station he called the farm and Hank, the hired man, came to pick him up. The ten miles out to the farm seemed like a hundred. But at last in his own room Jim spread out the two sheets of paper he'd brought with him and opened up lesson one of the correspondence course.

There was no mistake. The stencils of the course manuals had been cut on Mr. Herald's ancient machine. There was the same nick out of the side of the o, and the h was flattened on the bulge. The r was minus half its base.

Mr. Herald had prepared the course.

Mr. Herald must then be M. H. Quilcon. But why had he denied any knowledge of the name? Why had he refused to see Jim and admit his authorship of the course?

At ten o'clock that night Mr. McAfee arrived with a special delivery letter for Jim.

"I don't ordinarily deliver these way out here this time of night," he said. "But I thought you might like to have it. Might be something important. A job or something, maybe. It's from Mr. Quilcon."

"Thanks. Thanks for bringing it, Mac."

Jim hurried into his room and ripped open the letter. It read:

Dear Mr. Ward:

Your progress in understanding the principles of power co-ordination are exceptional and I am very pleased to note your progress in connection with the tenth lesson which I have just received from you.

An unusual opportunity has arisen which I am moved to offer you. There is a large installation of a power coordination engine in need of vital repairs some distance from here. I believe that you are fully qualified to work on this machine under supervision which will be provided and you would gain some valuable experience. The installation is located some distance from the city of Henderson. It is about two miles out on the Balmer Road. You will find there the Hortan Machine Works at which the

installation is located. Repairs are urgently needed and you are the closest qualified student able to take advantage of this opportunity which might lead to a valuable permanent connection. Therefore, I request that you come at once. I will meet you there.

Sincerely,
M. H. Quilcon

For a long time Jim Ward sat on the bed with the letter and the sheets of paper spread out before him. What had begun as a simple quest for information was rapidly becoming an intricate puzzle.

Who was M. H. Quilcon?

It seemed obvious that Mr. Herald, the banker and part-time newspaper publisher, must be Quilcon. The correspondence course manuals had certainly been produced on his typewriter. The chances of any two typewriters having exactly the same four or five disfigurements in type approached the infinitesimal.

And Herald—if he were Quilcon—must have written this letter just before or shortly after Jim's visit. The letter was certainly a product of the ancient Woodstock.

There was a fascination in the puzzle and a sense of something sinister, Jim thought. Then he laughed aloud at his own melodrama and began repacking the suitcase. There was a midnight train he could get back to Henderson.

It was hot afternoon again when he arrived in the town for the second time. The station staff looked up in surprise as he got off the train.

"Back again? I thought you'd given up."

"I've found out where Mr. Quilcon is. He's at the Hortan Machine Works. Can you tell me exactly where that is?"

"Never heard of it."

"It's supposed to be about two miles out of town on Balmer Road."

"That's just the main street of town going on down through the Willow Creek district. There's no machine works out there. You must be in the wrong state, mister. Or somebody's kidding you."

"Do you think Mr. Herald could tell me anything about such a machine shop. I mean, does he know anything about machinery or things related to it?"

"Man, no! Old man Herald don't care about nothing but money and that little fool paper of his. Machinery! He can't hook up anything more complicated than his suspenders."

Jim started down the main street towards the Willow Creek district. Balmer Road rapidly narrowed and turned, leaving the town out of sight behind a low rise. Willow Creek was a glistening thread in the midst of meadow land.

There was no more unlikely spot in the world for a machine works of any kind, Jim thought. Someone must be playing an utterly fantastic joke on him. But how or why they had picked on him was mystifying.

At the same time he knew within him that it was no joke. There was a deadly seriousness about it all. The principles of power coordination were right. He had staved and dug through them enough to be sure of that. He felt that he could almost build a power co-ordinating engine now with the proper means—except that he didn't understand from where the power was derived!

In the timelessness of the bright air about him, with the only sound coming from the brook and the leaves on the willow trees beside it, Jim found it impossible to judge time or distance.

He paced his steps and counted until he was certain that at least two miles had been covered. He halted and looked about almost determined to go back and re-examine the way he had come.

He glanced ahead, his eyes scanning every minute detail of the meadowland. And then he saw it.

The sunlight glistened as if on a metal surface. And above the bright spot in the distance was the faintly readable legend:

HORTAN MACHINE WORKS.

Thrusting aside all judgment concerning the incredibility of a machine shop in such a locale, he crossed the stream and made his way over the meadow towards the small rise.

As he approached, the machine works appeared to be merely a dome-shaped structure about thirty feet in diameter and with an open door in one side. He came up to it with a mind ready for anything. The crudely painted sign above the door looked as if it had been drawn by an inexpert barn painter in a state of intoxication.

Jim entered the dimly lit interior of the shop and set his case upon the floor beside a narrow bench that extended about the room.

Tools and instruments of unfamiliar design were upon the bench and upon the walls. But no one appeared.

Then he noticed an open door and a steep, spiral ramp that led down to a basement room. He stepped through and half slid, half walked down to the next level.

There was artificial lighting by fluorescent tubes of unusual construction, Jim noticed. But still no sign of anyone. And there was not an object in the room that appeared familiar to him. Articles that vaguely resembled furniture were against the walls.

He felt uneasy amid the strangeness of the room and he was about to go back up the steep ramp when a voice came to him.

"This is Mr. Quilcon. Is that you, Mr. Ward?"

"Yes. Where are you?"

"I am in the next room, unable to come out until I finish a bit of work I have started. Will you please go on down to the room below? You will find the damaged machinery there. Please go right to work on it. I'm sure that you have a complete understanding of what is necessary. I will join you in a moment."

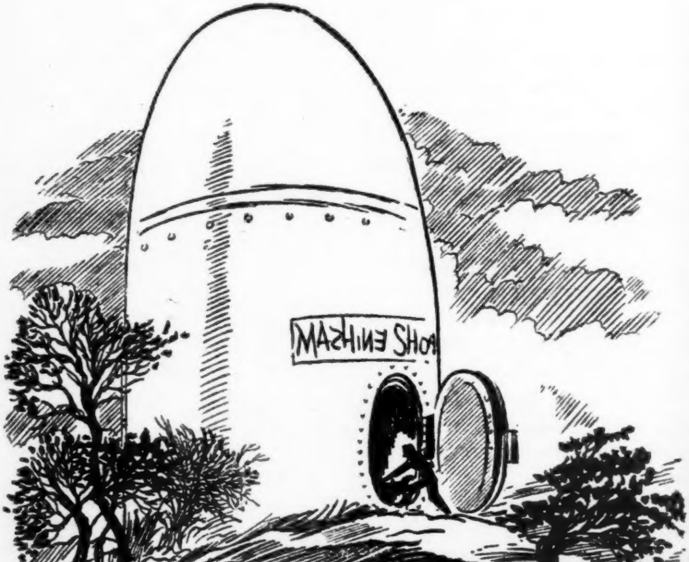
Hesitantly, Jim turned to the other side of the room where he saw a second ramp leading down to a brilliantly lighted room. He glanced about once more, then moved down the ramp.

The room was high-ceilinged and somewhat larger in diameter than the others he had seen and it was almost completely occupied by the machine.

A series of close fitting towers with regular bulbous swellings on their columns formed the main structure of the engine. These were grouped in a solid circle with narrow walkways at right angles to each other passing through them.

Jim Ward stood for a long time examining their surfaces that rose twenty feet from the floor. All that he had learned from the curious correspondence course seemed to fall into place. Diagrams and drawings of such machines had seemed incomprehensible. Now he knew exactly what each part was for and how the machine operated.

He squeezed his body into the



narrow walkway between the towers and wormed his way to the center of the engine. His bad leg made it difficult, but he at last came to the damaged structure.

One of the tubes had cracked open under some tremendous strain and through the slit he could see the marvelously intricate wiring with which it was filled. Wiring that was burned now and fused to a mass. It was in a control circuit that rendered the whole machine functionless, but its repair would not be difficult, Jim knew.

He went back to the periphery of the engine and found the controls of a cranelike device which he lowered and seized the cracked sleeve and drew off the damaged part.

From the drawers and bins in the walls he selected parts and tools and returned to the damaged spot.

In the cramped space he began tearing away the fused parts and wiring. He was lost and utterly unconscious of anything but the fascination of the mighty engine. Here within this room was machine capacity to power a great city.

Its basic function rested upon the principle of magnetic currents in contrast to electric currents. The disovery of magnetic currents had been announced only a few months before he came home from the war. The application of the discovery had been swift.

And he began to glimpse the fundamental source of the energy supplying the machine. It was in the great currents of gravitational and magnetic force flowing between the planets and the suns of the universe. As great as atomic energy and as boundless in its resources, this required no fantastically dangerous machinery to harness. The principle of the power coordinator was simple.

The pain of his cramped position forced Jim to move out to rest his leg. As he stood beside the engine he resumed his pondering on the purpose it had in this strange location. Why was it built there and what use was made of its power?

He moved about to restore the circulation in his legs and sought to trace the flow of energy through the engine, determine where and what kind of a load was placed upon it.

His search led him below into a third sub-basement of the building and there he found the thing he was searching for, the load into which the tremendous drive of the engine was coupled.

But here he was unable to comprehend fully, for the load was itself a machine of strange design, and none of its features had been covered in the correspondence course.

The machine upstairs seized upon the magnetic currents of space and selected and concentrated those flowing in a given direction.

The force of these currents was then fed into the machines in this room, but there was no point of reaction against which the energy could be applied.

Unless—

The logical, inevitable conclusion forced itself upon his mind. There was only one conceivable point of reaction.

He stood very still and a tremor went through him. He looked up at the smooth walls about him. Metal, all of them. And this room —it was narrower than the one above—as if the entire building were tapered from the dome protruding out of the earth to the basement floor.

The only possible point of reaction was the building itself.

But it wasn't a building. It was a vessel.

Jim clawed and stumbled his way up the incline into the engine room, then beyond into the chamber above. He was halfway up the top ramp when he heard the voice again.

"Is that you, Mr. Ward? I have almost finished and will be with you in a moment. Have you completed the repairs? Was it very difficult?"

He hesitated, but didn't answer. Something about the quality of that voice gave him a chill. He hadn't noticed it before because of his curiosity and his interest in the place. Now he detected its unearthly, inhuman quality.

He detected the fact that it wasn't a voice at all, but that the words had been formed in his brain as if he himself had spoken them.

He was nearly at the top of the ramp and drew himself on hands and knees to the floor level when he saw the shadow of the closing door sweep across the room and heard the metallic clang of the door. It was sealed tight. Only the small windows—or ports—admitted light.

He rose and straightened and calmed himself with the thought that the vessel could not fly. It could not rise with the remainder of the repair task unfinished—and he was not going to finsh it; that much was certain.

"Quilcon!" he called. "Show yourself! Who are you and what do you want of me?"

"I want you to finish the repair job and do it quickly," the voice replied instantly. "And quickly—it must be finished quickly."

There was a note of desperation and despair that seemed to cut into Jim. Then he caught sight of the slight motion against the wall beside him.

In a small, transparent hemisphere that was fastened to the side of the wall lay the slug that Jim had seen at the postoffice, the thing the woman had called an "armadillo." He had not even noticed it when he first entered the room. The thing was moving now with slow pulsations that swelled its surface and great welts like dark veins stood out upon it.

From the golden-hued hemisphere a maze of cable ran to instruments and junction boxes around the room and a hundred tiny pseudopods grasped terminals inside the hemisphere.

It was a vessel—and this slug within the hemisphere was its alien, incredible pilot. Jim knew it with startling cold reality that came to him in the waves of thought that emanated from the slug called Quilcon and broke over Jim's mind. It was a ship and a pilot from beyond Earth—from out of the reaches of space.

"What do you want of me? Who are you?" said Jim Ward.

"I am Quilcon. You are a good student. You learn well."

"What do you want?"

"I want you to repair the damaged engine."

There was something wrong with the creature. Intangibly, Jim sensed it. An aura of sickness, a desperate urgency came to his mind.

But something else was in the foreground of Jim's mind. The horror of the alien creature diminished and Jim contemplated the miracle that had come to mankind.

"I'll bargain with you," he said quietly. "Tell me how to build a ship like this for my people and I will fix the engines for you."

"No! No—there is no time for that. I must hurry—"

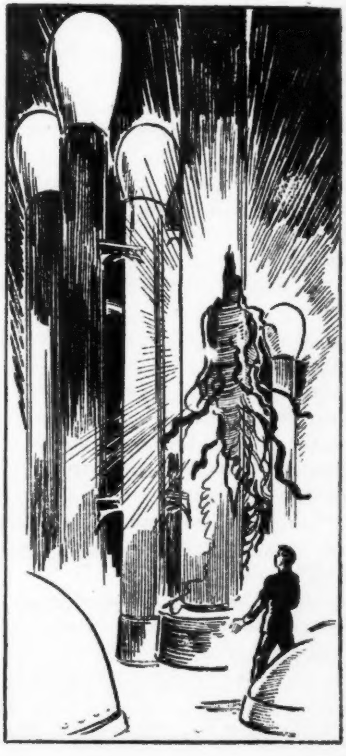
"Then I shall leave without any repairs."

He moved towards the door and instantly a paralyzing wave took hold of him as if he had seized a pair of charged electrodes. It relaxed only as he stumbled back from the door.

"My power is weak," said Quilcon, "but it is strong enough for many days yet—many of your days. Too many for you to live without food and water. Repair the engine and then I shall let you go."

"Is what I ask too much to pay for my help?"

"You have had pay enough. You can teach your people to build



power co-ordinator machines. Is that not enough?"

"My people want to build ships like this one and move through space."

"I cannot teach you that. I do not know. I did not build this ship."

There were surging waves of troubled thought that washed over his mind, but Jim Ward's tenseness eased. The first fear of totally alien life drifted from his mind and he felt a strange affinity for the creature. It was injured and sick, he knew, but he could not believe that it did not know how the ship was built.

"Those who built this ship come often to trade upon my world," said Quilcon. "But we have no such ships of our own. Most of us have no desire to see anything but the damp caves and sunny shores of our own world. But I longed to see the worlds from which these ships came.

"When this one landed near my cave I crept in and hid myself. The ship took off then and we traveled an endless time. Then an accident to the engine killed all three of those who manned the ship and I was left alone.

"I was injured, too, but I was not killed. Only the other of me died."

Jim did not understand the queer phrase, but he did not break into Quilcon's story.

"I was able to arrange means to control the flight of the ship, to prevent its destruction as it landed upon this planet, but I could not repair it because of the nature of my body."

Jim saw then that the creature's story must be true. It was obvious that the ship had been built to be manned by beings utterly unlike Quilcon.

"I investigated the city of yours nearby and learned of your ways and customs. I needed the help of one of you to repair the ship. By force I could persuade one of you to do simple tasks, but none so complex as this requires.

"Then I discovered the peculiar customs of learning among you. I forced the man Herald to prepare the materials and send them to you. I received them before the person at the postoffice could see them. I got your name from the newspapers along with several others who were unsatisfactory.

"I had to teach you to understand the power co-ordinator because only by voluntary operation of your highest faculties will you be able to understand and repair the machine. I can assist but not force you to do that."

The creature began pleading again. "And now will you repair the engine quickly. I am dying—but shall live longer than you—it is a long journey to my home planet, but I must get there and I need every instant of time that is left to me."

Jim caught a glimpse of the dream vision that was the creature's home world. It was a place of

security and peace—in Quilcon's terms. But even its alienness did not block out the sense of quiet beauty that Quilcon's mind transmitted to Jim's. They were a species of high intelligence. Exceptionally developed in the laws of mathematics and theory of logic, they were handicapped in bodily development from inquiring into other fields of science whose existence was demonstrated by their logic and their mathematics. The more intellectual among them were frustrated creatures whose lives were made tolerable only by an infinite capacity for stoicism and adaptation.

But of them all, Quilcon was among the most restless and rebellious and ambitious. No one of them had ever dared such a journey as he had taken. A swelling pity and understanding came over Jim Ward.

"I'll bargain with you," he said desperately. "I'll repair the engine if you'll let me have its principles. If you don't have them, you can get them to me with little trouble. My people must have such a ship as this."

He tried to visualize what it would mean to Earth to have space flight a century or perhaps five centuries before the slow plodding of science and research might reveal it.

But the creature was silent.

"Quilcon—" Jim repeated. He hoped it hadn't died.

"I'll bargain with *you,*" said Quilcon at last. "Let me be the other of you, and I'll give you what you want."

"The other of me? What are you talking about?"

"It is hard for you to understand. It is union—such as we make upon our world. When two or more of us want to be together we go *together* in the same brain, the same body. I am alone now, and it is an unendurable existence because I have known what it is to have another of me.

"Let me come into your brain, into your mind and live there with you. We will teach your people and mine. We will take this ship to all the universes of which living creatures can dream. It is either this or we both die together, for too much time has gone for me to return. This body dies."

Stunned by Quilcon's ultimatum, Jim Ward stared at the ugly slug on the wall. Its brown body was heaving with violent pulsations of pain and a sense of delirium and terror came from it to Jim.

"Hurry! Let me come!" it pleaded.

He could feel sensations as if fingers were probing his cranium looking, pleading for entrance. It turned him cold.

He looked into the years and thought of an existence with this alien mind in his. Would they battle for eventual possession of his body and he perhaps be subjected to slavery in his own living corpse?

He tried to probe Quilcon's thoughts, but he could find no sense or intent of conquest. There were almost human amenities intermingled with a world of new science and thought.

He knew Quilcon would keep his promise to give the secrets of the ship to the men of Earth. That alone would be worth the price of his sacrifice—if it should be sacrifice.

"Come!" he said quietly.

It was as if a torrent of liquid light were flowing into his brain. It was blinding and excruciating in its flaming intensity. He thought he sensed rather than saw the brown husk of Quilcon quiver in the hemisphere and shrivel like a brown nut.

But in his mind there was union and he paused and trembled with the sudden great reality of what he knew. He knew what Quilcon was and gladness flowed into him like light. A thought soared through his brain: Is sex only in the difference of bodily function and the texture of skin and the tone of voice?

He thought of another day when there was death in the sky and on the Earth below, and in a little field hospital. A figure on a white cot had murmured, "You'll be all right, Jim. I'm going on, I guess, but you'll be all right. I know it. Don't miss me too much."

He had known there would be no peace for him ever, but now there was peace and the voice of Quilcon was like that voice from long ago, for as the creature probed into his thoughts its inherent adaptability matched its feelings and thought to his and said, "Everything *is* all right, isn't it, Jim Ward?"

"Yes . . . yes it is." The intensity of his feelings almost blinded him. "And I want to call you Ruth, after another Ruth—"

"I like that name." There was shyness and appreciation in the tones, and it was not strange to Jim that he could not see the speaker, for there was a vision in his mind far lovelier than any Earthly vision could have been.

"We'll have everything," he said. "Everything that your world and mine can offer. We'll see them all."

But like the other Ruth who had been so practical, this one was, too. "First we have to repair the engine. Shall we do it, now?"

The solitary figure of Jim Ward moved towards the ramp and disappeared into the depths of the ship.

THE END.

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No one punished him for knowing too much—the knowledge itself took care of that. And very thoroughly and permanently—

Vocation

by GEORGE O. SMITH

Illustrated by Williams

Gerd Lel Rayne stood in the arched doorway of the living room of his home and smiled at the Terran. Andrew Tremaine smiled up at his host with an almost microscopic feeling of annoyance. The Terran was a large man, well proportioned, but the other was somewhat larger and somewhat in better proportion. The annoyance was the usual jealousy of the better man.

Tremaine knew that Gerd was a health," boomed Gerd in a resonant to be a better man, and he stifled his feeling of annoyance because hating Gerd was unjust. Besides, Tremaine wanted a favor and one does not irritate a favor-giver.

Gerd Lel Rayne was of a breed that could know when a man disliked him no matter how well it was concealed. Therefore—

Andrew smiled. "You've been well?"

"Positively dripping with good health," boomed Gerd in a resonant voice. "And yourself?"

"Fair to middling."

"Good. I'm glad to hear it. Will you have refreshment?"

"A cigarette, perhaps."

Gerd opened an ornate box on the table and offered Andrew a cigarette. Andrew puffed it into illumination and exhaled a cloud of smoke. "Busy?" he asked.

"Yes," drawled Gerd. "I'm always busy, more or less. But being busy or un-busy is my own desire. Being without something to do would drive me crazy, I'm sure." Gerd laughed at the thought. "At the present time I'm busy seeing you. Is this a business visit or a personal visit?"

"Partly pleasure, partly business. There's something been bothering me for some time."

"Glad to help— That's what I'm here for, you know."

"Now that I'm here," admitted Andrew with some abashment, "I have a feeling that the same question has been asked and answered before. But I want to hear, first-hand, why your race denies us the secret of interstellar travel."

"Because you have not developed it yet," said Gerd. "Yes, we could give it to you. You couldn't use it."

"You're looking down at us again."

"I'm honestly sorry that I give you that opinion. I have no desire to look down at anything or anyone. Please believe me."

"But—"

"May I offer an hypothetical case?" asked Gerd, and then went on because he knew the answer to his own question: "A hundred years ago, the Terrans were living without directive power. You used solar phoenix power. It brought you out of the mire of wire and machinery under which Terra writhed. You were, you thought, quite advanced. You were. But, Andy, could you have used directives? Supposing that I had given you the secret of directive power? What would have happened?"

"Um— Trouble, perhaps. But with supervision?"

"I can not give you supervision. I am but one. Consider, Andy. A planet filled with inventive people, a large quantity of which are highly trained technically. What would they say to a program which restricted them to any single phase? We came, and all that we could do to assist was to let your race know that directive power was available. The problem of power is an interesting thing, Andy. The initial steps into any realm of power are such that the discoverers are self-protected by their own lack of knowledge, and their investigations lead them into more and more knowledge; they gain the dangerous after learning how to protect themselves against it. The directive power could destroy not only Terra but the entire Solar System if improperly applied."

"What you're saying is that we

could not understand it," objected Andrew.

"I admit it. Could a savage hurt himself if permitted to enter a powerhouse—even one of the primitive electronic places? Obviously he could. Even were he given the tools of the art, his survival might be a matter of guesswork. Only study permits any of us to work with power, Andy. When the Terrans are capable of handling the source of interstellar power, it shall come to them—be discovered by them, if you will. Meanwhile I can but watch and wait, and when I am approached I can and will try to guide Terra. That, Andy, is my job."

"We'll hunt for it!"

"I know," said Gerd Lel Rayne with a smile. "Your fellows are hunting now. I approve. But I may not point the way. Your race must only find it when you are ready to handle it."

Gerd arose from his chair and flexed the muscles across his back. The reason for his arising was not clear to Andrew immediately, but it came less than three seconds later—It was Gaya Lel Rayne, Gerd's mate. Andrew arose and greeted her with genuine pleasure.

Her smile was brilliant and genuine. "Business?" she asked.

"Yes," answered Gerd. "But do not leave, because the discussion is interesting. Andy, the perfect example of the persistent newsman, is holding forth on the interstellar power."

"They've discovered it?" asked Gaya in hopeful pleasure.

"No," answered Tremaine. "We'd like to, though."

"You will," said Gaya. "I know you will."

"We know we will, too," said Andrew. "Our irritation is not that we shall be denied it, but that it takes us so long to find it when there is one on Terra that knows it well."

"Please, Andy. I do most definitely not know it well. I am no technician."

Gaya looked at her husband quickly. "He's excusing himself," she said with a laugh.

"He's hoping that we'll believe that his knowledge is no better than ours and that we'll be content. But, Gerd, I know that you know enough to give us the answer."

"You know? How, may I ask?"

"It is inconceivable that you would not know."

"Perhaps I do," came the slow answer. "Perhaps I do." The tone of the speech was low and self-reflective. "But again, perhaps I, too, am in the dangerous position of not knowing enough. You Terrans have a saying—'A little knowledge is dangerous.' It is true. Again we strike the parallel. I give you stellar power and you, knowing nothing about its intricacies, use it. Can you hope to know down which road lies total destruction?"

"You are possibly right. We could learn."

"But not from me," said Gerd with finality. "That I cannot and will not do. One can not supervise and control the inventiveness of a planet such as yours. Your rugged individualists would be investigating in their small laboratories with inadequate protection, and inevitably one or more of them would strike the danger-spot."

"I'm answered," said Andrew reluctantly. "Answered negatively. I'm forced into accepting your statements. They are quite logical—and Gaya's willingness to be glad for us when she thought that we had discovered it is evidence that you are not withholding it with malice. But logic does not fill an empty spot, Gerd."

Gerd laughed. "If you had everything you want, your race would have died out before it came out of the jungles."

Tremaine laughed. "I know," he admitted. "Also—and I'm talking against my own race—there is the interesting observation that if Heaven is the place where we have everything we want, why are people always trying to live as long as they can?"

"Perhaps they're not certain of the hereafter."

"Whether they are firmly convinced yes or as firmly convinced no, they still view death with disfavor. I'd say their dislike was about even. All right, Gerd. I'll take your statements as you made them and with reluctance I'll return to my work and ponder."

"Stay for dinner," urged Gaya. She gave him the benefit of a brilliant smile, but Andrew shook his head.

"I've got to write an editorial," he said. "I've got to change one already written. I was a bit harsh about you, and I feel it was unfair. Perhaps you'll join us at dinner tomorrow?"

Gaya laughed. "You're speaking for Lenore, too?"

"Yes," nodded Andrew. "She'll be glad to see you."

"Then we'll be glad to come," said Gerd.

As he left, Gerd turned to his wife and said: "He'll bear watching."

"I caught your thought. He will. Shall I?"

"From time to time. Tremaine suspects. He is a brilliant man, Gaya, and for his own peace of mind, he must never know the truth."

"If he suspects," said Gaya thoughtfully, "it may mean that he has too little to do. There are many sciences—would it be possible to hint the way into one. That might occupy his mind enough to exclude the other question."

"In another man it might work. But Andrew Tremaine is not a physical scientist. He is a mental scientist working in an applied line. To give him the key to any science would mean just momentarily postponing the pursuit of the original problem. Were he a physical scientist, his mind would never have come upon the question in the first place. I'm almost tempted to let loose the initial key to stellar power."

Gaya blanched. "They'd destroy everything. No, Gerd, not that. You'd be defying the Ones."

"I know," nodded Gerd. "I have to continue for my own personal satisfaction. Giving in is the easy way—and entirely foreign to our policy. Terra must find their goal alone. You and I, Gaya, must never interfere. We are emissaries only; evidences of good will and friendship. Our position is made most difficult because of the general impression, held by all Terrans, that an ambassador is a man who lies to you, who knows that he is lying, and who further knows that you know he is lying—and still goes ahead and lies, smiling cheerfully at the same time."

"We've given good evidence of our friendship."

"Naturally. That's our main purpose in life. To befriend, to protect, even to aid when possible. One day, Gaga, Terra will be one of us. But guiding Terra and the Solar System into such a channel is most difficult. Yet, who is to do it but you and I?"

"Shall we request advice? Perhaps the Ones will be interested to know that Terrans are overly ambitious?"

"You mean they're too confounded curious? The Ones know that. The Ones put us here because we can cope with Terra—I'll make mention of it in the standard report—but coping with Terra is our problem, presented to us, and given with the expectation that we shall handle it well. To ask for any aid would be an admission of undisputed failure."

"I guess you're right."

Gerd smiled. "Honestly, there is no real danger. If we are capable of protecting them, we should be equally capable of protecting ourselves against them. And," said Gerd with an expansive gesture, "the Ones rate us adequate. We can do no more than to prove their trust. After all, our race has been wrong about a classification only once in three galactic years."

"I might be worried," smiled Gaya. "Isn't it about time for them to make another mistake?"

Gerd put his hands on her shoulders and shook her gently. Superstitious lady," he said, "that's against the Law of Probabilites."

"No," disagreed Gaya with a smile. "Right in accordance with it. When the tossed coin comes up heads ten million times without a tail, it indicates that there may be two heads on the coin, or that some outside force is at work. I was fooling, Gerd."

"I know," he said with a laugh. "Now enough of our worries. What's on the program this evening?"

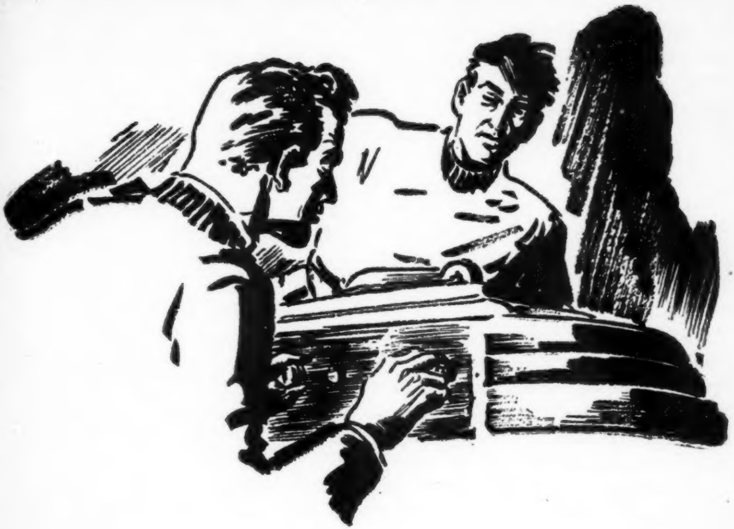
"Dinner with Executive General Atkins and wife. Theater afterwards."

"I'd better dress, then," said Gerd. "Complete with all the trimmings. Toni Atkins would be horrified at the idea of dining without the males all girded and braced in full formal dress."

"Once dinner is over, you'll enjoy them."

"I always do," said Gerd. "They're both interesting people. Save for her ideas of propriety."

Gaya pushed him in the direction



of the dressing room. "I do, too," she called after him with malicious pleasure. "And remember, that I'm just as they are—and not above them at all."

"I might be able to get the legislature to pass laws against women," returned Gerd thoughtfully.

"The result might be quite devastating," said Gaya.

The answer came back through the closing door. It was a cheerful laugh, and: "Yes, wouldn't it?"

Andrew Tremaine jerked the paper from the electrotyper and pressed two buzzers simultaneously. The answer to one came immediately: "Yes?"

"Tell Jackson that the editorial page is complete and that he should get the revised copy set up."

"Yes, Mr. Tremaine. It's on the way."

"Should be coming out of his typer now."

"I'll call him."

The door opened, and the answer to buzzer number two entered.

He was a tall, thin, pale-looking man with stooped shoulders and thick glasses. He came in and seated himself before Andrew's desk and waited in silence until the editor spoke.

"Gene, how many fields in psychology have you covered?"

The other shook his head. "Since I came to work for you, only one. Applied psychology, or the art of finding out what people want to be told and then telling them."

"That's soft-soapism."

"You name it," grinned the thin

man. "You asked for it. Oh, we've carried the burning torch often enough—that's the other psychology. Finding out what people think is good for them and crying against it."

"Or both."

"Or both," smiled Gene.

"This is a crazy business, sometimes. I'm on another branch again, Gene. How much of the human brain is used?"

"Less than ten percent."

"Right. What would happen if the whole brain were used?"

"Andy, what kind of a card file would you need to do the following: One: locate from a mention the complete account of a complex experience; two: do it almost instantly, and three: compile the data in five dimensions?"

"Five dim—? Are you kidding?"

"Not at all. Each of the five senses are essentially different and will require separate cards to make the picture complete. A rose smell, for instance, would be meaningless alone—you must classify it. The same card would not fit for all rose-smelling memories since some are strong, some are weak, some are mixed with other minor odors, and so forth. Do you follow?"

"Yes, but aren't we getting off the track?"

"Not at all. If your mind can run through ten to the fiftieth power experiences in five mediums and come up with the proper, correlated accounts, all in a matter of seconds—think what the same mind might be able to do if presented with a lesser problem."

"Why can't it do just that?"

"Because when you start to figure out a problem, something restricts your brain power to less than ten percent of its capability."

"That means that ninety percent of the brain is nonfunctional."

"Right. It is. You can carve better than half of a man's brain out and not impair a single memory, or action, or ability."

"And nature does not continue with a nonfunctional organ."

"Nature would most certainly weed out anything that was completely useless. Evolution of a nonfunctional part does not happen."

"Appendix?"

"It had a use once. It is atrophying now. But the brain should be increasing since we're using it more every year. Instead of being forced into increase by demand, the brain is already too big for the work. How did it get that way?"

"You'll never explain it by the law of supply and demand," said Gene. "We might go over a few brains with analyzers."

"And if you get a nonconforming curve, then what?"

"Fifty years of eliminating the sand to get the single grain of gold."

"You mean process of elimination?"

"Didn't I say it?"

"You'd never recognize it," said Andrew. They both laughed.

"But what brought you to this conference?" asked Gene. "Knowing you as I do, you aren't just spending the time of day."

"No, I'm not. Look, Gene, what do you know about Gerd Lel Rayne?"

"Just common knowledge."

"I know. But catalogue it for me. I am trying to think of something and you may urge the thought into solidification."

"Sounds silly," said Gene. "But here it is—and quite incoherent." He laughed. "What was I saying about the excellence of memory files? Well, anyway, Gerd Lel Rayne is a member of a race that has and employs interstellar travel. Terra has nothing, produces nothing, manufactures nothing that this race requires. Neither, according to Gerd, has this race anything that would interest Terrans. Save power and the stellar drive."

"Stellar power," muttered Andrew.

"What was that? Stellar Power? Call it that if you wish. It may well be called that for lack of a better name. At any rate, it is more than obvious that Gerd Lel Rayne and his wife enjoy us. They are emissaries—ambassadors of good will, if you want to call them that—whose sole purpose is to give advice upon things that Terra does not quite understand."

"Except stellar power."

"Reason enough for that," said Gene. "Terra is a sort of vicious race. We were forced to fight for our very existence. We fought animals, nature, plants, insects, reptiles, the earth itself. We've fought and won against weather and wind and sun and rain. And when we ran out of things to fight, we fought among ourselves because there were too many differences of opinion as to how men should live. We, Andrew Tremaine, are civilized—and yet the one thing we all enjoy is a bare-handed fight to the finish between two members of our own race."

"That's not true."

"Yes it is. What sport has undergone little change for a thousand years? It is no sport using equipment. The equipment-sports are constantly changing with the development of new materials with which to make the equipment. Take the ancient game of golf, for instance. They used to make four strikes to cover a stinking four hundred yard green. That's because control of materials was insufficiently perfect to maintain precision. No two golf balls were identical, and no two clubs were alike.

"But—and stop me if my rambling annoys you, although it is seldom that I am permitted to ramble—the sport of ring-fighting is still similar to its inception. Men stand in a ring and fight with their hands until one is *hors de combat* for a period of ten seconds. They used gloves at one time, I believe, but men are harder and stronger now—and surgery repairs scars, mars, and abrasions. Also, my fine and literary friend, the audience, gentle people, like to see the vanquished battered, torn, and slightly damaged. Civilization! One step removed from Ancient Roma, where they tossed malcontents into an arena to see if he could avoid being eaten by a hungry carnivore!

"Well, the one thing that Terra would most probably do is to make use of this drive and go out and fight with the Ones."

"Are they afraid?"

"I don't know. I'd hardly think so."

"Gene, you're wrong. They wouldn't even bother brushing us off."

"No?"

"No. We'd be polished off before we got to see them. There's something else there and I don't know what it is."

"You don't follow the hatred angle?"

"You, my friend, have a warped personality. You have the usual viewpoint of a man of minor stature. That lanky body of yours has driven you into believing that your race is tough, vicious, and most deadly to everything. Not because you really believe it, but you yourself are not tough, deadly, or invincible but you want to belong to a group that is."

"You think them benign?"

"I wonder—but am forced to believe the overwhelming pile of evidence. In every way, Gerd and his wife have been willing to co-operate. They've willingly submitted themselves to our mental testing—and that is complete, believe me—and in every case they have proven intelligent, enthusiastic, and capable. Oh, we make mistakes, but not such complete blunders. I'll tell you one thing, Gene. I went over there today to ask one question. I wanted to know just why they refuse to give us the stellar power. Their answer was that we were not ready for it—and in the face of it, I was forced to agree."

"Whitewash."

"Think so? Then tell me how you can tell."

"Gerd Lel Rayne is a supergenius, according to the card files. Intelligence Quotient 260! That, my friend, is high enough to fool the machine!"

"Nonsense."

"A machine, Andy, is a mechanical projection of a man's mind. It is built to do that which can not be done by man himself. It is capable—sometimes—of exceeding man's desire by a small amount, but is seldom capable of coping with a situation for which it is not engineered. Since no man on Terra has an I.Q. of higher than about 160, for a guess, the machine can not be engineered to analyze mentalities of I.Q. 260 without fail."

"You do not believe the I.Q. 260 then?"

"Yes, I believe that machine. But the one that gives the curves of intent can be fooled by such a man."

"Then what is his purpose?"

"Supposing thise race intends to take over?"

"Then why don't they just move in and take?"

"Time. Say this race is overrunning the Galaxy. No matter how they start, plans must be made, even if they originated on Centauri. Since—and let's try to put ourselves in their place and consider. They have not moved in. That means a waiting period of some kind. It also means considerable distance from home base, because if we were close to them, the program would have started already. Now, since there is this waiting program, we can assume that they are not ready yet. And not being ready means one of two things. They are finding opposition on other planets of other systems. In this case it is not Divide and Conquer, but *keep divided in order to conquer!*"

"I'm beginning to follow you."

"If we had the drive, and the power for it, their job might well be impossible. I doubt that anything alive could make conquest of an armed planet unless that planet was quite inferior in weapons. Given the same weapons and power, and at best stalemate. For the very energy-mass of a planet is unbelievably great, and the weapons that may be permanently anchored in the granite of Terra would be able to withstand anything up to and including another, equally armed planet to stalemate or draw. And granting that Terrans are hard-boiled people because we were brought up that way from infancy, we'd give any race a mighty tough fight."

"Then what do you want me to do?"

"I want knowledge. I want something that will permit me to use that ninety percent of my brain."

"How in the devil do you expect me to come up with something like that?"

Andrew Tremaine smiled solemnly and said, flatly: "Gene, I'm almost convinced that Gerd Lel Rayne and company are generating some force-field that prevents it!"

Gene sat silent after that. He thought about it for some time before answering. "The answer to that," he said very slowly and very carefully, "is this: If some force is being generated to prevent full use of the human brain, a counter-force may be set up to nullify the field. That will be simple enough once we isolate the field that prevents thought. But on the other hand, if no such field exists and it is just one of those paradoxes, we'll have considerable working to do to generate a force-field that *will* permit one hundred percent brain-usage."

"Right. And remembering that this may be the answer to Terra's existence, we'll have to keep it silent."

"You're handing me the job?"

"Yes. You're a practising psychologist. You're also an amateur technician. If you need anything, no matter what, requisition it and I'll see that it is O.K.'d. Send the thing to me marked *personal* so that some clerk won't toss it out for not belonging to the publishing business."

"You know how much this will cost?"

"Sure. You'll start off with a copy of the I. Q. Register and recorder and work your way up through the intent-register. From there on in, Gene, you're on your own. And—alone! I do not want to know what you're doing. I might let it out before Rayne or his wife. Come to me as soon as you find something."

"Right. But look, Andy. Why not give me a batch of signed requisitions so that you won't know what I'm working on next?"

"Good. I'll sign me one block, and mail it to your home. You are fired as of now for . . . for—"

"Differing with the management in a matter of policy."

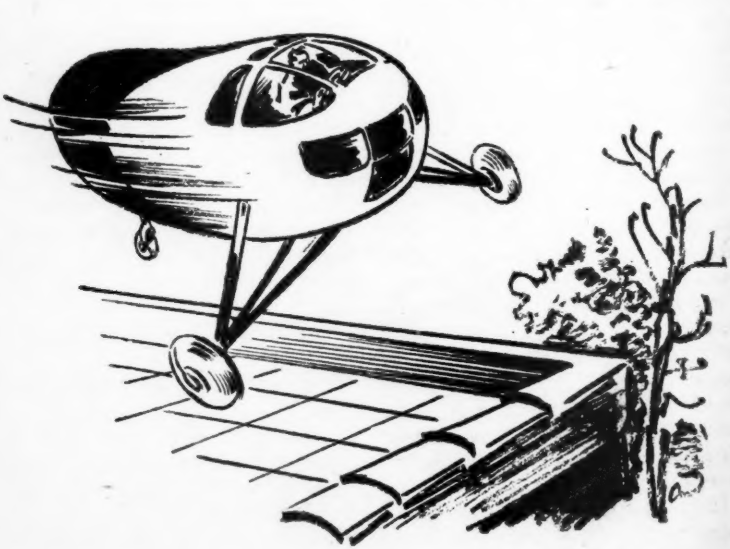
"Excellent. And when the requisition numbering the last of the block comes in, I'll sign up and mail another block to your home. Leave a forwarding address. The bank will honor your signature on company checks to the tune of one thousand dollars per month."

"Applied psychology is wonderful," smiled the tall, thin man. "You wouldn't have trusted me a thousand years ago."

"There are a lot of people I wouldn't trust now, today."

"But the difference is, Andy, that nowadays you know whom you can trust."

Gaya Lel Rayne's entry into the grand ballroom had the same effect, just as it always had. In another woman it might have produced triangle-trouble, but Gaya's attraction for men was not her only charm; the woman who hated her for her ability to draw men was one who did not know her. Once introduced, and permitted to talk with Gaya, the jealous dislike died, for Gaya was not far below her husband in wit and intelligence. Like all intelligent people, Gaya was capable



of making herself liked by all, even in the face of dislike. Those who still felt the twinge of jealousy often pitied her; feeling that her beauty was compensation for the necessity that she be of high intelligence, and quite certain of their husbands, whom they knew would not care to live their lives with a woman who outshone them in every field. They knew also that there was but one man on the whole planet that Gaya loved—Gerd. He was the only man she could possibly love and the only man who could possibly love her. Gerd was the only man who could even keep up with her thought-processes.

Gerd had his amusement, too. Partly in payment for the slight put upon them by their husbands, Gerd was surrounded by women as he entered. And they knew that he was more than capable of running far ahead of their own devious thought-processes, a condition which they hoped was untrue in their husbands. Yet he was interesting and attractive, and equally as versatile as his wife.

The party took on a faster air, and all were dazzled save one. Andrew Tremaine stood on the side lines and watched.

He saw Gaya whirl from man to man across the dance floor and with equal amusement he saw Gerd moving through a closely-knit crowd. He wished fervently for someone to discuss it with, but even his wife was in the press of people about Gerd Lel Rayne.

Emissaries, he thought. Ambassadors who cut their mentality because they did not care to appear so far beyond their friends would certainly develop a contempt. It must be so, if for no other reason than it could not be otherwise. Andrew wondered what made them tick.

He'd heard from Gene Leglen briefly. It was not good. A negative result—which was inconclusive. Yet, according to the letter, the thought-process frequencies had been inspected carefully by the most delicate detector that Gene could make, and he had found nothing out of line. Strays from the I. Q. Register machine that ran continually in the shielded vault below the psychology building in government square were recorded; a few pipmarkers leaked out of the intent-register on strong impulses and caused Gene's machine to chatter wildly at long and indefinite times; even a few infra-faint recordings came from the intent-register machine as a matrix was sent through to record changes from a previous marking were caught on Gene's detector.

But nothing with overall intensity. Nothing that could be expected to block the operation of nine tenths of a man's brain.

Andy saw Rayne approaching with Lenore, and smiled.

"Why so thoughtful?" asked his wife.

"Thinking deeply again?" asked Rayne. "More power?"

"Don't laugh at me, Gerd," pleaded Andrew."

"Laugh at you?" asked Gerd in

genuine dismay. "Never. You are a good friend, Andrew. I will never laugh at you." He shook his head. "Tell me, what makes you think I'm laughing?"

"I can not but think, sometimes, that you are playing with all of us."

"Please . . . please. Is there nothing I can do to dispel this idea, this fixation of yours?" he turned to Lenore. "Do you, too, think I'm toying?"

"No," she said quickly. "You're too fine a person to toy with another. I know."

Gerd flustered at that. "The trouble with this job of mine," he said, "is that no one ever tells me that I'm a meddling fool or to mind my own business."

"That's your fault," said Andrew. "Honestly, I doubt that there is a man on this confounded planet that wouldn't hasten to carry your banner. You are a well-liked man, Gerd, and as such no one wants to tell you off. Furthermore, you always seem to know when to let a man alone—and that in itself precludes any possibility of telling you to stay away. How do you know that sort of thing?"

"Accident of birth," said Gerd wryly.

"Spacewash."

"You think I studied to learn it?"

Andrew laughed. "If I thought that, I'd apply for entrance to the same school," he said. "I'd like to have that trait myself."

Lenore interrupted. "Andy," she said, "you must remember that Gerd is a sensitive man. You might have been a sensitive man at one time, but being a publisher has taken all of the reticence out of you. Wresting hidden secrets from people who have things to hide is life and blood for a newsman—and it does not make a man sensitive for other people's feelings."

"Well," grumbled Andrew, "I'd like to be able to recognize when someone does not want to be bothered, anyway."

"And those are just the people you'd bother, I know."

"But what was bothering you?" asked Gerd with honest concern.

"I was just thinking about brains. One of the women said that your wife's brains excluded her from the 'dangerous female' classification because she wouldn't be really bothered with any one of the husbands present. It led to other trains of thought and I came to the universal question: Why does a man use but nine tenths of his brain?"

"Oh that? That's obvious! You have a flier. What is its peak power?"

"About seven dirats."

"And it develops that total power only at high speed. Suppose you drove the machine at that power all the time?"

"Wouldn't last—besides, you couldn't. It takes time to get to that speed."

"Right. It is a matter of capacity. The brain is built to exceed the present demand, Andy. When it is needed, it will be available. Nature expects that the brain will be called on, one hundred percent, and she intends to keep increasing that availability as it is needed. But it takes millions of years to develop and evolve something as intricate as brain-material, and nature does not intend that you and I catch up with her and find her adaptive ultimate inadequate to proceed because of her lack of foresight. The necessities of brain material have far exceeded her ability to evolve it, up to the present time. You're using infinitely greater proportions of your brain than your ancestors. Suppose that they had been running at full capability? You'd be limited; at the top of your capability to progress.

"So, Andrew, you're running on one tenth of your brain all because no real thinking can come out of a full brain. The fill will increase, with evolution and science, to high percentages, but will never reach saturation. Saturation, I believe, might be dangerous."

"Sounds plausible," admitted Andrew.

"It is true," said Gerd. "And now before you drive yourself mad by thinking in circles, come and have a good time."

"No, I've just thought of something important. Your explanation gave me the impetus to think it out. Lenore, do you mind if I leave for an hour?"

"I'd better go along—"

"Please do not," objected Gerd. "Andy, I'll see that Lenore is properly entertained in your absence. May I?"

Andrew nodded, and Lenore smiled brightly. "I'll be in excellent company," she said.

"The best," agreed Andrew. "Don't forget that Gaya is here, too."

"This is an evening of pleasure," said Gerd. "One, I should not deny Gaya her admiration nor her friends the opportunity of being with her. Two, Gaya and I understand one another perfectly."

"Look, Gerd, I was fooling with Lenore. No one has any illusions about either you or Gaya, or fears, or doubts, or worries. If you'll keep Lenore from being lonely while I'm gone, I'll be more than grateful. See you in an hour."

"Fair enough."

Andrew drove his flier at almost peak power all the way to Gene's home and dropped in on the roof with a sharp landing. He raced inside and found Gene working over a bread-board layout of an amplifier for the thought frequencies.

He told Gene about Rayne's speech and waited for an answer.

"What did you expect?" asked Gene. "The answer?"

"No, but I hoped to catch him."

"In catching anything, Andy, you should first know more than your rabbit."

"You do not believe it?"

"Nope." Gene handed the editor a sheet of paper. "Follow that?"

Andrew started down the listed equations and stopped after the fourth. "Way ahead of me. How did you derive this term here?"

"By deduction."

"Guesswork?"

"Deduction. It can be nothing else."

"But knowing that is like establishing the validity of a negative result."

"Yes, but I tried everything else and nothing else worked."

"You tried everything? Look, Gene everything covers—"

"I know," grinned Gene. "Space is bigger than anything. I'm going to make another try at seeking the possible conflicting term. That is, as soon as I get this field-generator adjusted higher."

"You did it with that?"

"So far, yes. But it still leaves a lot to be desired. Now, I've got it running properly. Give me that paper and stand back out of the way!"

Gene set the temple-clamp over his head and snapped the switch. The equipment warmed for a minute, and then Gene started to put characters down on the page as fast as he could write. He filled a half page in finger-cramping fury, and then stopped writing to stare at the page for a full ten seconds. Another equation appeared after this, and another which Gene combined. There was no more writing for a full minute then, and Andrew lost all track or semblance of order to Gene's writing. A scant term here, a single character there, a summation line—it became a sort of mathematical shorthand; a mere reminder of the salient points in the argument. The manipulation of the terms went on mentally.

The tenseness increased. The shorthand scrawls became fewer and fewer and disappeared entirely. The paper was forgotten, and the pencil dropped from Gene's fingers.

Andrew watched, held by the intensity of Gene's thinking. The other man was motionless, his muscles tensed slightly. An hour passed, and Gene had not moved, before Andrew became worried. He remembered—

Gene had not blinked his eye for forty minutes!"

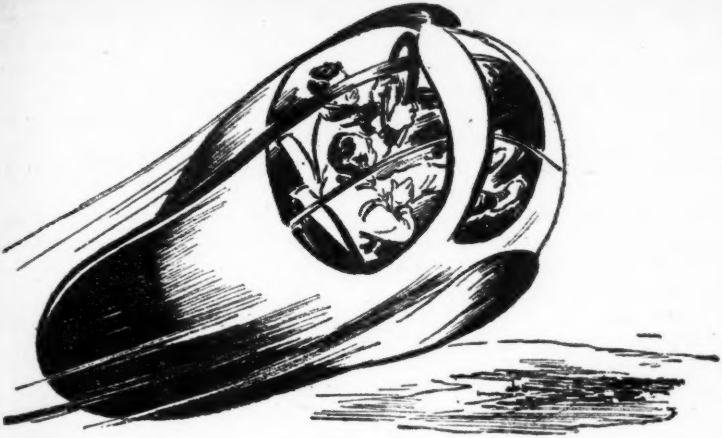
"Gene! Gene!"

No answer.

"Shut that thing off!"

No answer.

Andrew stood up, looked around, and then stepped forward. Nothing happened, so he took another step forward. What had happened to Gene? He didn't know, but he was going to find out. He stepped forward again, and then walked into the field of the machine. A wave of excitement filled him as the leakage-impact caught him; it heightened his perceptive sense and increased his emotional powers proportionately to the square of the distance between himself and the machine. He touched the corner of the desk with the tip of his hand and though he was not looking at the wood he knew that it was Terran oak, had been varnished with synthanic twice, and that it should be refinished again in a few months if it was to be preserved adequately. The air in the room came to his notice, and a portion of his brain found time to wonder at the phenomena for the breath of life is seldom questioned. Yet the air



seemed tangy, pleasant, as though some subtle perfumes had been blended in it. He forgot the air in a quick inspection of the inert man. Yes, he knew without close examination that the psychologist was dead. From what cause? Andrew guessed that it was overload; if his senses and brain power were heightened with this mere field-leakage of Gene's machine, the effect of being in absolute contact with the machine's output would be similar to running a small motor without protective circuits from a high-power source. Gene had succeeded too well.

His perception of his surroundings continued to lift into the higher levels. Knotty little problems did not bother him, and his mind leaped from problem to answer without stopping to investigate and inspect the in-between steps.

Andrew wondered whether leaving the machine would cause his increased perception to drop. Forgetting Gene because the dead psychologist was no longer a sentient being, Andrew turned and walked away from the desk. The field must be terrific, he thought, and to further check the field effect, Andrew left the building and made his way down the street.

He finally dismissed the dead man from his mind. The things he saw and felt and knew were of greater consequence—and whether or not the effect failed, there was one great question that he, Andrew Tremaine, was going to solve.

He returned to the party.

He stood upon the rim of the dance floor and considered the crowd of circling dancers. He listened to the light chatter and the foolish laughter and he pitied them. His ears, he found, had taken on a sort of selectivity and were infinitely higher in sensitivity—and yet he could control that sound-pickup to a comfortable degree. Talk from the far side of the floor came to him, filtered from the rest of the general noise-level by his own, newly-found ability. He shamelessly listened to the conversations, and found them dull and uninteresting.

Through the broad doorway at the far side of the floor he looked in upon the bar. The odor of liquor came then, powerful and overwhelming until Andrew decided that it was too strong and caused his smell-sense to drop.

Foolishness.

There were so many important things to be done and these people were frittering their time away in utter foolishness. He wondered whether Gerd Lel Rayne would agree with him, and with the thought he knew where to find the emissary. He turned and went through the moving crowd impatiently until he found Rayne and Lenore.

"You're back?" asked Lenore.

"Obviously," he said shortly. "Rayne, I have a question to ask."

"Come now, Andrew," came the booming, resonant answer, "you're not going to mix business with pleasure?"

"I must—for I may lose the trend of my thought if I wait."

"Then by all means . . . Lenore, you'll forgive us?"

"Yes," smiled she, "but not for too long."

Andrew contemplated his wife's exquisite shoulders as she left, and then he turned back to Gerd and bluntly asked: "Gerd, doesn't all this waste of time, effort, and brainpower disgust you?"

"Not at all. I find that relaxation is good."

"But the time—and life is so short."

"Continuous running of any machine will cause its life to be shorter. The same is true of the brain."

"Thought is thought, and we use the same portion of the brain while thinking foolishness as while thinking in deep, profound terms."

"Perhaps so."

"Don't you know?"

"Who does?"

"You and I know. Gerd, what is behind all of this? Who are you?"

"You know who I am."

Yes, Andrew knew. His higher perception told him without argument that Gerd Lel Rayne was exactly what the emissary claimed.

"But why?"

"Pure and sheer altruism."

"What do you want?"

"Nothing. We are but waiting until you evolve to the proper degree to join us. At that time you are welcome."

"Then," stormed Andrew, "why not help us evolve?"

"Impossible."

"Nonsense. You are not too far above me."

"At the present time you and I are fairly equal in intelligence. You've been working with the mental amplifier, haven't you? A more hellish instrument has never been invented, Andy."

"I find myself enjoying the sensation. If there is one thing that will raise our general level sufficiently, it is this machine. Can it be, Gerd, that your race does not want us to evolve? Do you want us to remain ignorant? Do you fear our competition?"

"My race," said Gerd with pride, "has absolutely nothing that your race can use. Your race has absolutely nothing that can possibly be of interest to us—save eventual evolution into our civilization-level. That we desire."

"Since the level of my intelligence has been raised to equal yours, why couldn't the same process work on my race as a whole. The problem then will be solved immediately."

"I see that your answer does not lie with me. Also, since you are equal to me, you must be capable of understanding the whole truth. Will you come to my home immediately?"

"To solve this problem? Certainly."

"Then come quickly. A member of the Ones is there now, reading my periodic report. I will prevail upon him to see you. But it must be swift, for he is due to leave in about one hour."

They went from the building side by side and entered Rayne's flier. Andrew wondered whether the emissary was willing to discuss the problem before his visit, and decided to try. "Who is your visitor?"

"He is Yord Tan Verde."

"A sort of high overseer?"

"Sort of. He is not connected with the Grand Council of Galactic Civilization in any managerial position, though. Yord is merely one of the group-leaders—a field representative."

"Do you mind discussing yourself?"

"I'd prefer not—though if you ask me a question that I think is not too personal, I'll be glad to answer."

"Your I. Q. is 260, according to the register. If he is your immediate superior, what must his be?"

Rayne shook his head. "I don't really know," he answered. "Your Terran method of rating intelligence is based upon age. Since your age is based upon a purely Terran concept, we could not possibly rate our intelligence on your basis, until we encounter your machines. Frankly, I'd say his was higher—but you shall see."

Gerd stopped Andrew at the door to his library. "Wait," he said. "I'll see if Yord is willing to see you."

"If he isn't?"

"I'll be as persuasive as I can. I think he may be interested when I inform him that you have artificially increased your I.Q. to my level."

"You think so?"

"I know so. However, Andrew, it will not be a productive interest. Your means is still artificial and not to be assumed adequate."

"Why not?"

"Because without the machine to step up your brain, you'd revert to your original state in a single generation. It is worse than the fabled death of power—for power is also the power to destroy. To lose the power of understanding and to leave the machines of intelligence lying around for all to play with would be disastrous. No, you wait and I'll go in and prepare Yord Tan Verde."

Rayne left the door partly open. There was a greeting in an alien tongue, and then as the other voice continued, Gerd interrupted. "Please—I was trained in Terran. I think best in Terran. May we use it?"

Verde's reply came in Terran. "I'd forgotten."

"Thank you." Gerd Lel Rayne explained the situation to his overseer, and it was quite obvious to Andrew that Gerd accelerated the story continuously, and the emissary ended with an air that gave Andrew to understand that the overseer was quite impatient and that he was ahead of Gerd.

The answer was a single word. It was unintelligible to Andrew at first, and then it soaked in that Verde had uttered the word: "Inconsistent."

Gerd objected at length and began to explain the workings of Andrew's mind.

"Granted!" came the answer halfway through the account. "Have him enter—he may be able to understand."

Gerd came out and nodded at Andrew. "Go in," he said with an encouraging smile. "And—good luck."

"Thanks, Gerd," said Andrew. He straightened up his shoulders and entered the inner library.

He fell under the full, interested glance of Yord Tan Verde as he entered, and Andrew's eyes were held immobile. His springy step faltered, and his swift and purposeful walk slowed to a slogging trudge. Andrew came up to the desk, looked full in the face of the One, shook his head in understanding, finally; and then by sheer force dropped his eyes. He turned and left the room.

Gerd was waiting for him, a sympathetic smile upon his benign face. Andrew looked at him for a long, quiet moment. Then: "You—are his emissary?"

"I am—a moron," Gerd said evenly.

"You have a job."

"I am his in-between."

"Because only a moron can understand us," said Andrew slowly.

"No—because your people can understand me, but not the Ones."

"And my efforts with the mental amplifier can do no more than bring me to your level."

"Worse, Andrew. Nature causes many sports to be sterile because they interfere with her proper plan. Your machine will introduce sterility."

"I have one protecting job to do myself," said Andrew thoughtfully. "Or—perhaps it should be maintained—secretly, of course, for some emergency?"

"Your race is adequately protected."

Andrew shrugged. "I see. Terra will need neither the machine nor its product."

THE END.

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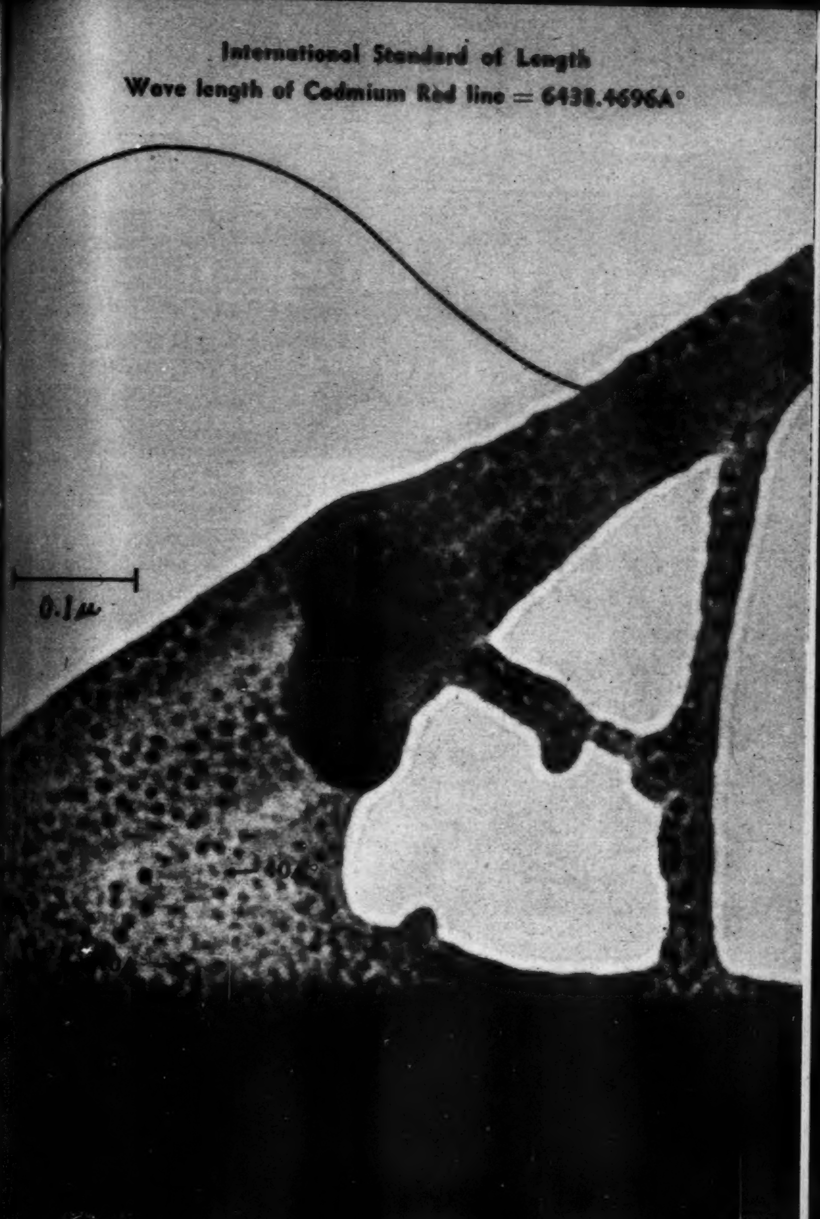
International Standard of Length
Wave length of Cadmium Red line = 6438.4696A°
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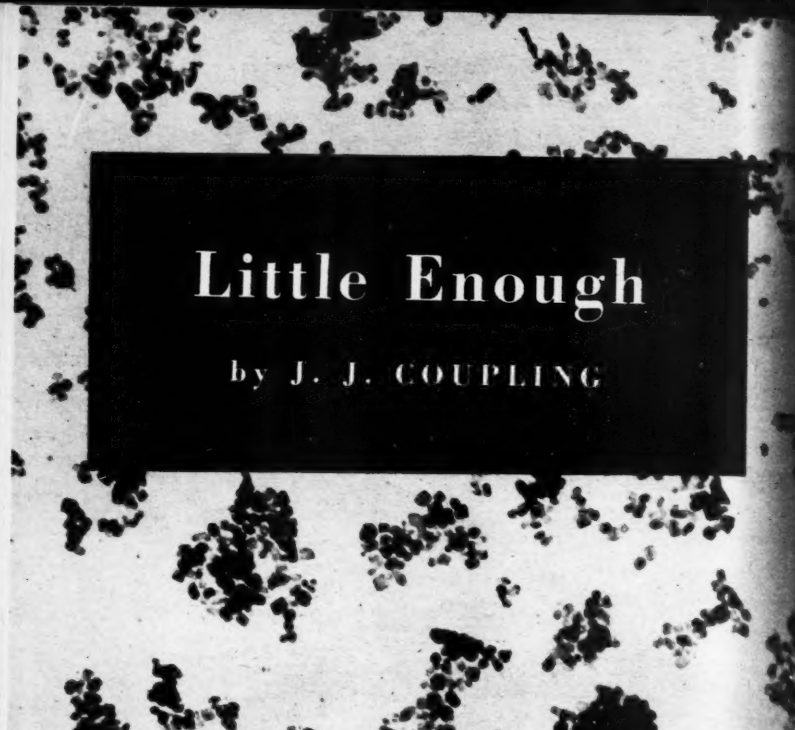
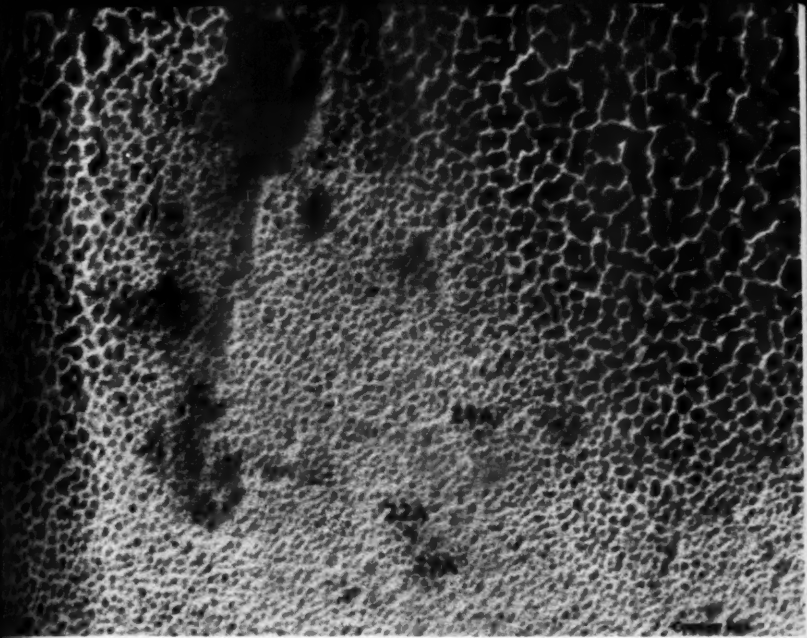
40A°

Little Enough

by J. J. COUPLING



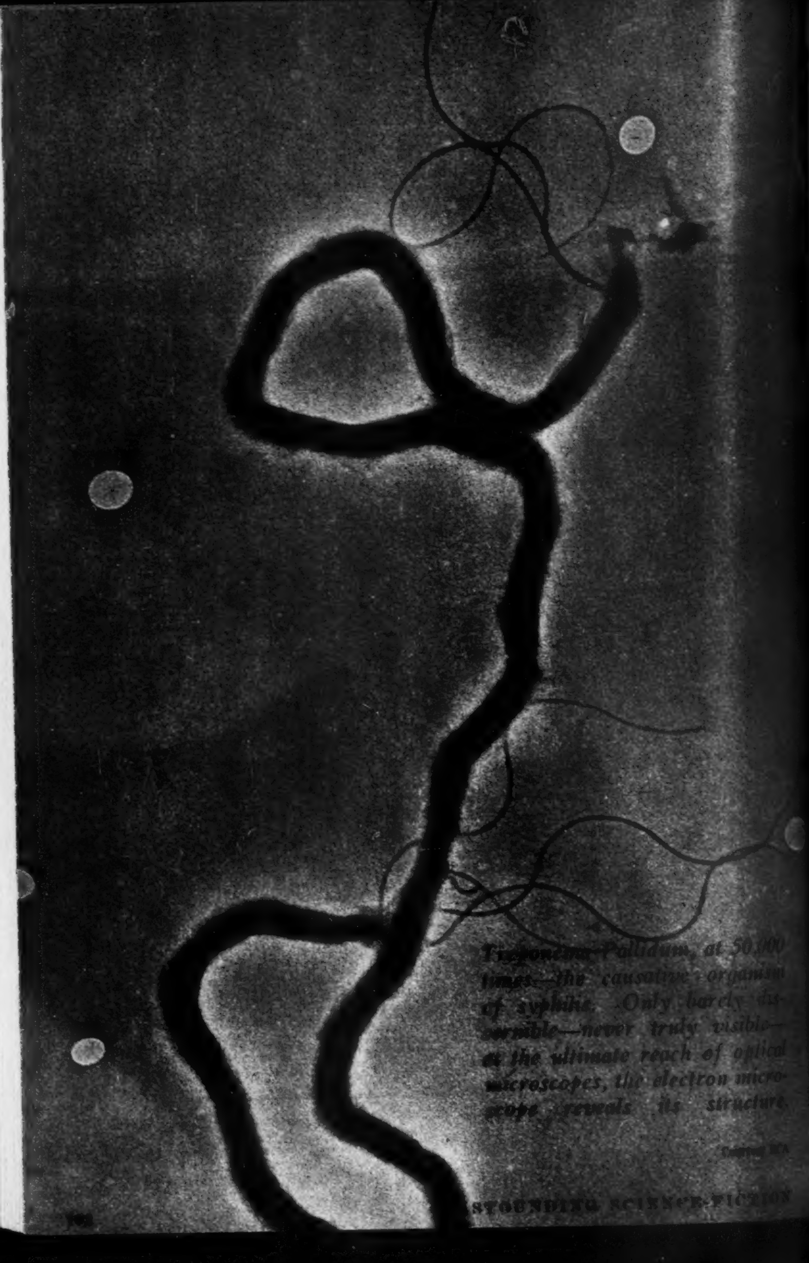
DuPont micrograph of titanium oxide particles, taken with an RCA Type B electron microscope, enlarged about 100,000 times. Page 99 shows a bit of koroseal, more than 200,000 times enlarged, compared with one wave length of Cadmium light, the International basic unit of length. Obviously, nothing so gross as light could show the structure of the koroseal!



An evaporated gold film. They're slightly less than 200,000 times enlarged, and details less than 1/200th of a light wave long are visible.

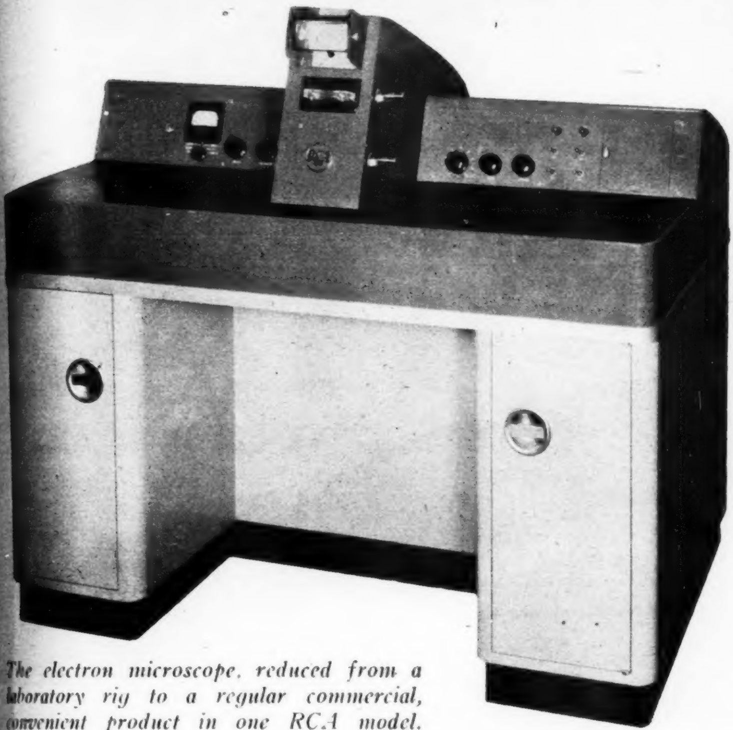
The theory of the electron microscope is simple, ingenious, and fascinating. Making the darned thing function though, is not simple, a hundred times as ingenious, and frustrating!

The essays of science-fiction writers on improving the microscope have been many if not varied. Discounting Poe's internal illumination, which was after all applied to a telescope, not a microscope, one of the earliest was the soundest. Fitz-James O'Brien in "The Diamond Lens" proposed that gem because of its high index of refraction. He had something on the ball, but perhaps he didn't know what. The truth of the matter is that his specimen would have had to be immersed in the diamond—or in something of equal index of refraction—for the diamond to have worked any improvement. And the hole his hero drilled through the lens would have ruined the whole thing, for the point is that light travels slowly in a material of high refractive index; its waves are short, and hence smaller objects can be imaged. But O'Brien's hero couldn't have seen the girl on the molecule at that; the improvement of his diamond lens



Treponema Pallidum, at 50,000 times—the causative organism of syphilis. Only barely discernible—never truly visible—at the ultimate reach of optical microscopes, the electron microscope reveals its structure.

Courtesy RCA

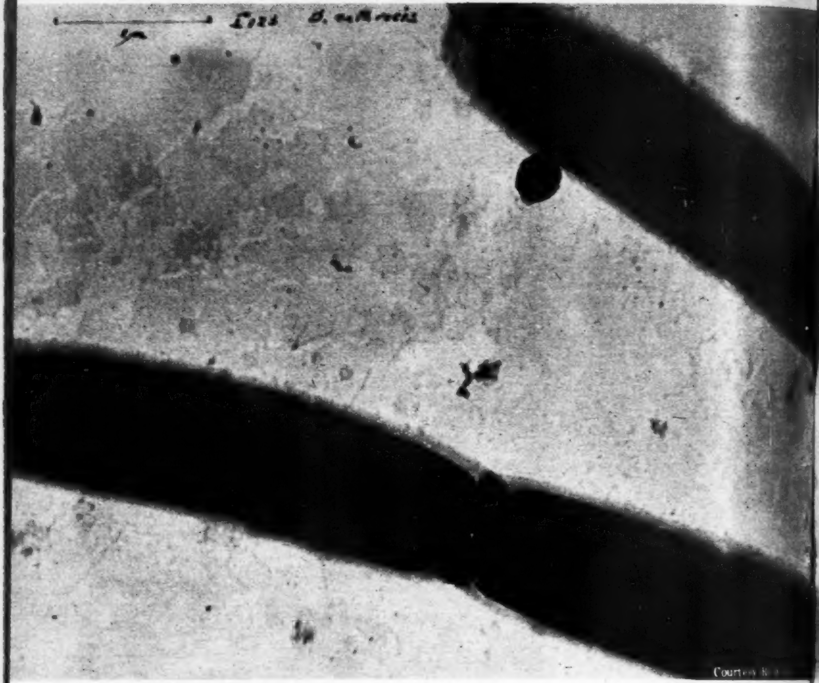


The electron microscope, reduced from a laboratory rig to a regular commercial, convenient product in one RCA model.

over a lens of glass would have been small indeed.

From O'Brien's time on the microscopes of science-fiction got worse rather than better. I remember being much impressed, in the days before science-fiction had one, let alone many a, magazine, with Dr. Hackensaw's super-microscope. Dr. Hackensaw achieved his result at first by taking a photomicrograph, then taking a photomicrograph of that, et cetera, until he had pictures of atoms. Perhaps they were merely silver grains, and he was fooled. But later on he worked undescribed improvements which by-passed the photography. Not a word was said about the relative size of the light-waves and the atoms, although a body much larger than an atom would have about as much effect on a light-wave as a fish pole has on a forty-foot wave in the ocean.

Later authors, aware or not of their limitations, have confined themselves to vague generalities



Courtesy

Bacillus Anthracis is a sheep and cattle killer—and a man-killer at times. It's one of the toughest of known organisms in its spore form.

about electronic amplifications. Anyway, they've run more to telescopes than to microscopes, and have made their mistakes in a large, rather than a small, way.

The physicists have done a little better. First one of them wrote a fine inscription for a tombstone for microscopist's dead hopes. They have been climbing out from under ever since.

That deadly tombstone inscription was by Ernst Abbe, the owner and reorganizer of the great optical firm of Carl Zeiss. Unlike many business men, Abbe was a first-rate scientist. One of his great contributions is reproduced below. (I have changed some Greek letters to English, so the notation may be unfamiliar.)

$$d = \frac{0.61\ L}{K \sin a}$$

Here L is the wave length of the illumination used. K is the index of refraction. a is the numerical aperture, a quantity akin to the f number of photography, except that even for f O, sin a becomes only unity. The letter d, alas, stands for the distance between the closest points or features of an object which can produce a separate image. This distance is called the defining power, or limit of definition.

The equation is reasonable, after all. Making an object small compared with the wave length of light means that it just scatters the light, and doesn't cast a distinct shadow. That's why the wave length appears upstairs, so that if the wave length is halved, we can see something half as big. The index of refraction appears downstairs because light-waves become shortened in traveling through materials which have a high index of refraction. It is reasonable that the aperture appear downstairs because with a wide lens we look at the object from many angles and gather more information about it. But, you see, there is a limit to the defining power. Just how small is it?

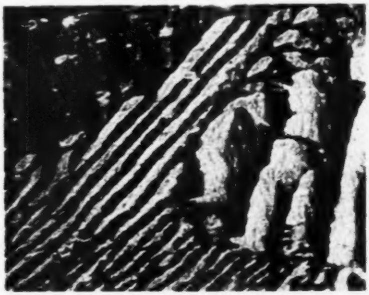
To sound truly scientific we should pause and get our units straight, for physicists don't talk English about microscopic objects any more than they do about telescopic objects—witness parsec and light-year. Physicists talk in angstrom units, written A, and in microns for which the Greek letter mu is used.

One micron = 1/10,000 centimeter
= 1/25,400 inch
One angstrom unit = 1/100,000,000 centimeter
= 1/254,000,000 inch

Physicists also talk about magnification in a special way. They say that the smallest object we can see

In metallurgy, the electron microscope works indirectly, but here reveals the pattern of pearlite in eutectoid steel.

Mingled crystals of metallic zinc and zinc oxide at 10,000 times life size.



Another sample of pearlite from eutectoid steel, also at 10,000 times.

Courtesy General Electric

GENERAL ELECTRIC

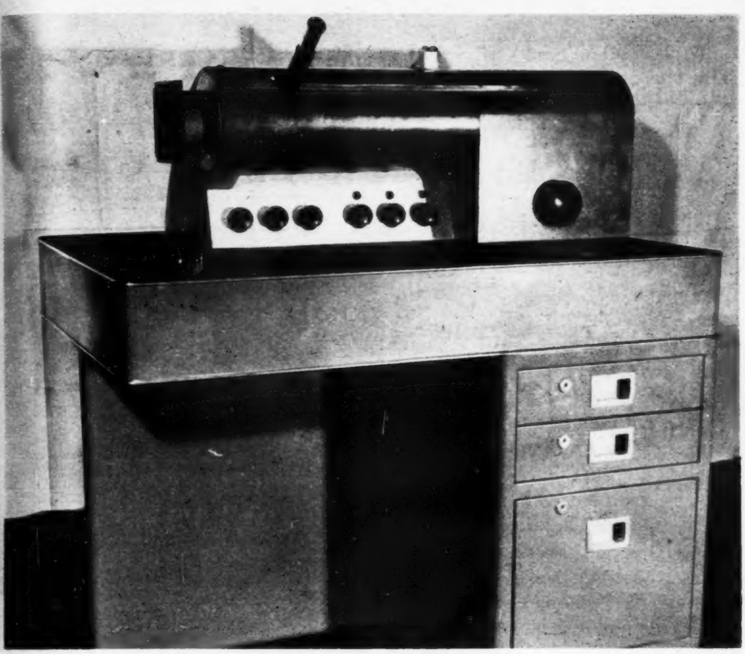
An ultracompact, portable model of the electron microscope produced by General Electric. The top case contains everything but the fore pump.

with our unaided eyes is 0.2 millimeters or 1/125 of an inch. Thus if a microscope enables you to see an object 1/125,000 of an inch diameter they say it has a useful magnification of 1,000. By this they mean that even if you focused another microscope on the image, you couldn't see any finer detail.

So, armed with units for measuring the small, let's see where the equation on the tombstone leaves us.

For instance, for bright yellow light, the most visible color, the wave-length is about 5,900 A. By putting the specimen under oil we can make the index of refraction about 1.7. The factor due to the numerical aperture cannot be greater than unity. So, from the equation, in bright yellow light we can theoretically see two points about 2,100 A apart, and practically can do a little worse than this. But even if we use ultraviolet light, which has a shorter wave-length, we can't see things much smaller than 1,000 A. And there are a lot of interesting things smaller than that.

At this point entered—dark field illumination. After all, we can't

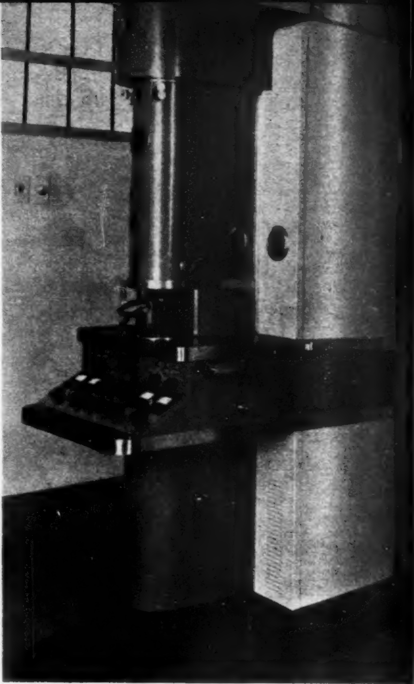


Another production model of electron microscope produced by General Electric for laboratory use—an end product of extensive research.

really see the stars as *objects*. Even with high-powered telescopes they don't have disks or features; they are just points of light. So microscopists shined light not *through* their speciments, but *on* them from the side. Then the presence of particles smaller than those which could be "seen" could be detected as featureless points of light. A somewhat empty victory, but progress of a sort!

Real life for microscopy came later, and the departure was radical. The trouble had been that light-waves were just too big. If people were to see smaller things, they had to see them without light-waves; they had to have an agency which was little enough. What is little enough? The answer has proved to be, the electron. And it's electrons and not light that microscopists are turning to these days.

Of course electrons don't completely solve the problem, for we know that electrons have wave-lengths just as light does, and our equation on the tombstone still holds. Happily, the wave-length of electrons is much shorter than that of light. It depends on the voltage



A different RCA-made type of electron microscope, a perfected form of something that started out as a whole laboratory full of busy apparatus.

by which the electrons are accelerated after leaving the cathode, and is

$$L = (150/V)^{1/2} \text{ angstrom units}$$

In the relation above, V is in volts. For instance, for 60,000 volt electrons, a common voltage in electron microscopy, the wave-length is 0.05 A, compared with about 5,000 A for light. We might think then that since we can distinguish points about 2,000 A apart with light, we could distinguish points about 0.02 A apart with electrons, and that's seeing details of atoms—no less! Unhappily, it isn't so easy. For one thing, electron lenses have very bad aberration. For another thing, the method of image formation requires the use of very small numerical apertures or f numbers. The best of electron microscopes have a resolving power of around 20A at present, or about one hundred times as good as light microscopes. Still, that's a lot. Using an analogy, it's like the difference between being able to see a skyscraper and being able to see the men that infest it.

Hints at seeing with electrons go clear back to Sir William Crookes and his "fourth state of matter" as he called ionic or electronic flow. Some readers may have seen a "Crookes Tube" in which a static machine or spark coil discharge generated a beam of electrons, casting the shadow of a maltese cross amid the fluorescence on the glass wall opposite. There is a primitive germ of electron microscopy.

But the electron microscope could not be born until the discovery that certain electric and magnetic fields act as electron lenses, focusing streams of electrons just as glass lenses focus light rays. This discovery may be regarded as an outgrowth of work on cathode ray tubes carried out in Germany by Busch from 1926 onwards. One of the first clear realizations that an electric field can form an electron lens exactly analogous to an optical lens came from Davisson and Calbick of the Bell Telephone Laboratories in 1931. By 1932 the Electron Microscope had been described in the *Zeitschrift für Physik,* and in 1934 L. Marton had examined biological specimens by electrons microscopy.

Before expending more space on electron microscopes, perhaps we should have a clearer idea of what one is. Here there is trouble, for there are all sorts of electron microscopes. Some don't even have lenses! One of the most useful is used in studying cold emission from metals. In this device, a very fine rounded point of metal is produced by etching. The point may be only about 1/100,000 of an inch in radius. This point is put into a glass tube and surrounded by a small metal cylinder. Opposite the opening in the cylinder the glass is coated with fluorescent material like that used on the screen of a cathode ray tube. A sketch of the device is shown in Figure 1. When the metal cylinder is made a few thousand volts positive with respect to the point, the electric field at the point becomes so intense that electrons are pulled out of the metal—cold emission. The electrons are accelerated so strongly in the first millimeter or so of their journey that they thereafter travel in practically straight lines and reach the screen without getting much mixed up by sidewise motions. When the electrons hit the screen they produce a sort of map of the electrons emitting properties of the surface of the point, magnified several hundred thousand times. Parts of the surface which emit copiously are shown bright; poorly emitting portions shown dark. In this way the emitting properties of various crystal faces of such materials as tungsten may be studied.

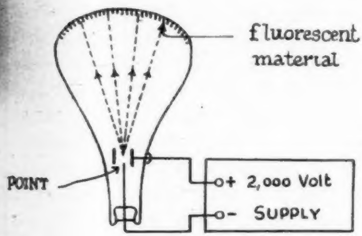


Fig. 1. The earliest cathode ray tubes were made this way—the electron microscope uses the principle.

Another even simpler microscope has been made by stringing a fine tungsten wire down a fluorescent coated glass tube and applying a

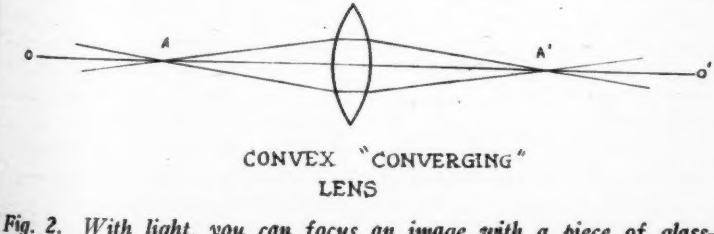
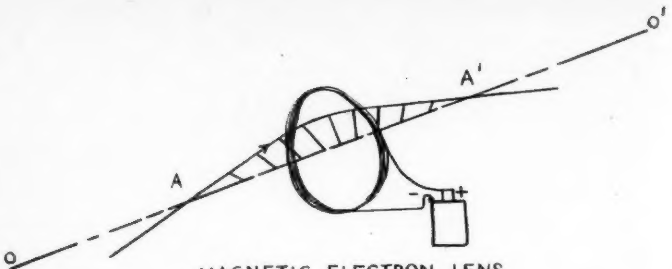


Fig. 2. With light, you can focus an image with a piece of glass—



MAGNETIC ELECTRON LENS

Fig. 3. —but with electrons you either twist them by magnetic force—

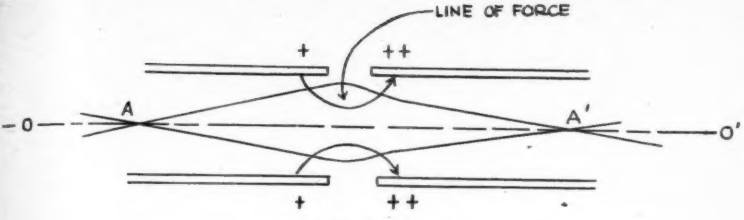
voltage between the wire and a loose spiral of wire touching the inside of the tube. By heating the tungsten wire, thermionic electrons are released, and these are pulled outward and strike the fluorescent coating. Thus a map of the thermionic properties of the tungsten wire is obtained.

In an even stranger microscope, a minute electron beam scans a metal surface just as the electron beam in an iconoscope or a cathode ray tube scans in television. The varying current of secondary electrons obtained is amplified and fed to a television receiver. On the television screen there appears a much magnified image of the surface in terms of its secondary emitting properties. The microscopic regions which are good secondary emitters appear bright and those which are bad secondary emitters appear dark.

Most electron microscopes, whether emission microscopes—microscopes imaging objects by means of electrons the objects themselves give off—or transmission microscopes—microscopes imaging objects by means of electrons shot through them—have lenses, either magnetic or electric, and perhaps we should describe these.

Both electric and magnetic lenses play much the part of the convex lens of the optical microscope. A convex lens, illustrated in Figure 2, takes a light ray originating at A on the axis o o and bends it back so that it crosses the axis at A′. This it does because the light ray is bent or refracted on striking a glass surface at an angle.

Suppose we have a coil of wire carrying current wrapped around the axis as shown in Figure 3. An electron going away from the point A on the axis will, on nearing the coil, move outward through the magnetic lines of force which lie roughly parallel to the axis. Because of this motion across the lines of force, the electron will turn to the right. As it turns to the right and goes around the axis, it is forced inward because it continues to move across lines of force, and so the electron executes a sort of spiral. To convince you that it will



ELECTRIC LENS

Fig. 4. —or bend their paths with high-voltage electrostatic fields.

eventually return to the axis at a point A′, rather than missing the axis completely, is a little too hard, and this will have to be taken for granted. It always does, though.

The electrostatic lens is simpler in a way, because there isn't any spiraling in it. Figure 4 shows in cross section an electrostatic lens consisting of two tubes T_1 and T_2, T_2 being positive with respect to T_1. Between T_1 and T_2 there is an electric field, indicated by the lines of force shown. Now as an electron enters this field, it is first forced inward by the lines of force leaving T_1. Later it is forced outward by the lines of force going to T_2. However, in the meantime the electron has gained speed because the lines of force point along its direction of motion. Thus the outward force near T_2 doesn't turn the electron as much as the inward lines of force near T_1 turned it. Hence the net effect is to force the electron toward the axis.

Now paths through these "lenses" are just the same forward as back; that is, an electron if reversed in direction and given the same speed backwards as forwards would travel along the same path from A′ to A as it traveled from A to A′. So, we see that a lens made of two tubes is converging regardless of whether the second tube is more or less positive than the first.

Figure 5 shows two symmetrical electron lenses, one with the center electrode more positive than the end electrode, and the other with the center electrode less positive than the end electrode. The electron paths from A to A' can be understood by noting that the paths must be convex toward the less positive electrodes—curving away from them—and concave toward the more positive electrodes—curving toward them. As the electrons go faster near the more positive electrode, the effect near the less positive electrode always predominates, and the lenses are always converging. In fact—have you guessed it?—all electron lenses are converging like convex light lenses*, and

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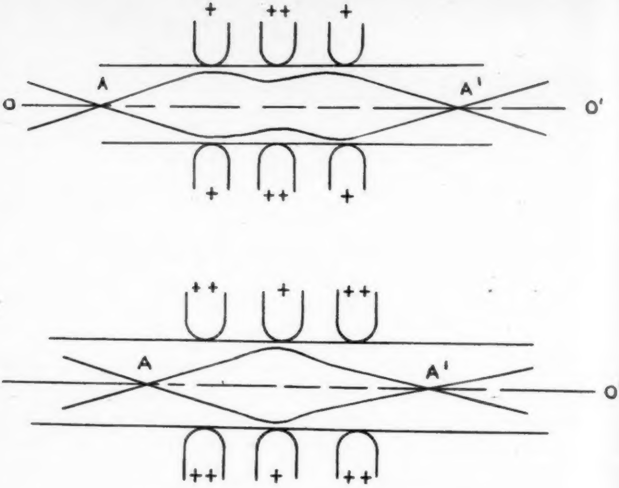
* With the reasonable provision that the lens exists between field free regions.



SYMMETRICAL ELECTRIC LENSES

Fig. 5. Modern cameras use multi-element lenses; multi-element electron lenses can, and are made too, for oscilloscopes and electron microscopes.

none is diverging like a concave lens.

That isn't the only limitation of electron lenses. In an electron lens, if the electric and magnetic fields along the axis are known, the complete focusing properties of the lens are known. By the fundamental nature of electric and magnetic fields, all fields which are the same along the axis are the same throughout the whole open part of the lens—excluding the interior of electrodes and dielectrics. The analogous but false statement about glass lenses would be that if one knew the kind of glass in each component and its thickness at the center, the focal length would be known. This of course isn't true, for in glass lenses the thickness of the lens has nothing to do with its curvature. But in electron lenses something of the sort is very sadly true. This means that the designer of electron lenses has only a limited control over the properties of the lenses he designs. For instance, *all* electron lenses have spherical aberration, and in those available at present this is so severe that the lenses have to be stopped down until they have an f number less than that of a pinhole camera.

Electron lenses have some advantages, though. For instance, the fields through which the electrons travel are the important things, and a small roughness on the surface of an electrode or a magnetic pole piece results in a very much smaller irregularity in the field some distance away, through which the electrons pass. So while to see a small object with a light microscope the lenses must be polished to a shining perfection, a good job of machining makes the magnetic pole pieces or the electrodes of an electron microscope sufficiently smooth so that much smaller objects can be seen.

Let's turn now to the actual electron microscope itself. A diagram of a magnetic electron microscope is shown in Figure 7.

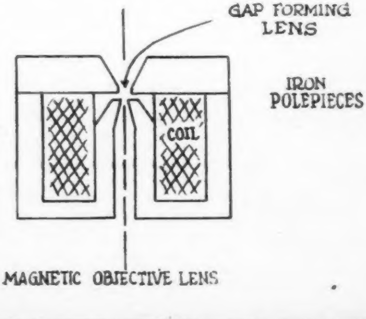
The electrons come from a heated filament 1, usually a hairpin of tungsten wire with a very sharply curved end which provides a sufficiently small source of electrons. This filament is about sixty thousand volts negative with respect to the rest of the microscope, so that after leaving this filament the electrons are accelerated to a high speed and remain at that speed throughout the rest of the microscope until they strike the photographic plate or fluorescent screen.

Following the electron source is a coil 2 which acts as a magnetic condenser lens, changing the diverging stream of electrons from the source into a slightly converging stream. This stream of electrons then strikes the object 3. Immediately following the object is the magnetic objective, a large coil with accurately machined pole pieces. The gap across which the focusing field passes has a small aperture and is close spaced. Figure 6 shows a cross section of an objective lens.

Some distance beyond the objective lens, at a point 5 where the electrons form an image, there is a small aperture which eliminates electrons which leave the objective lens at wide angles. Immediately following this aperture is the projection lens 6. This takes the electrons of the already magnified image 5 and projects a further magnified image—of the first image—on the fluorescent screen or photographic plate 8.

The electron microscope is just that simple. But there is one somewhat disturbing thought which occurs. The specimens are such things as sub—ordinary—microscopic viruses mounted on ever so much less than paper-thin films of collodion. Now in a light microscope, we see the object because it stops some of the light. But what is this specimen to stop a 60,000 volt electron? Will it slow the electrons up? That would be fatal! The lenses focus sharply only for electrons of a certain definite speed.

Fig. 6. The actual structure of a magnetic field lens may look like this.



Slowing up electrons by various amounts would give a blurred image.

Deflection is the answer. Some of the electrons passing through the specimen collide with its molecules and suffer minute deflections, and the denser the part of the specimen the greater the fraction of electrons deflected. Now the deflected electrons are apt to go off at an angle sufficient to make them miss the small aperture at the first image 5 of Figure 7. Hence, many electrons from dense spots of the specimen are lost, and so the image is formed.

Of course such a description of the electron microscope is really just stating the problem. The real trouble is the details. Take, for instance, the little detail of keeping air out of the microscope.

The traditional physicist's trick is to bolt the pieces together with moderately tight joints and paint the whole thing with many coats of glyptol or shellac. Indeed, much high vacuum equipment built by physicists looks like some strange natural formation of stalactites and stalagmites, the original contours being almost lost under the successive coatings of gunk. In such an apparatus windows for viewing are sealed in with Kotinsky cement—a sort of superior sealing wax—which is likely to have run out over the glass forming an irregular edge.

Such construction won't, of course, do in a commercial instrument, which must not only be neat in appearance, but must be capable of being taken to pieces and reassembled without a new paint job.

For the main joints two wrinkles will work. The most obvious is rubber gaskets. The rubber used must be dense, smooth, rather unrubbery stuff, which traps no air and allows no air to steal past it. Some synthetic rubbers are much better than natural rubber for this purpose, because they have fewer volatile components. Rubber gaskets are particularly suitable for joints which must be separated frequently.

Where large flat surfaces are to be joined in a vacuum-tight—yes, that's the term, although of course the *vacuum* doesn't leak out—man-

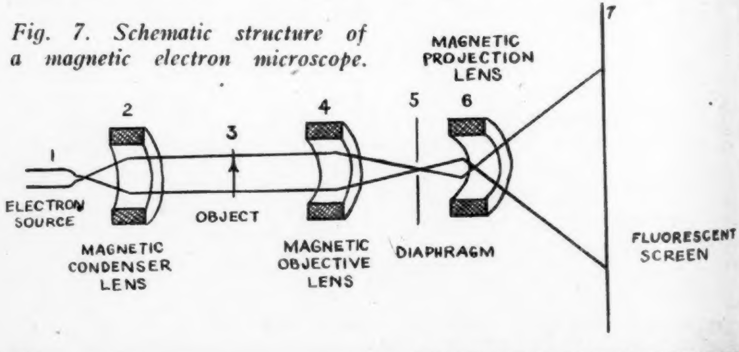


Fig. 7. Schematic structure of a magnetic electron microscope.

ner, a thin continuous wire of some soft metal such as copper or lead makes a fine gasket. There's a little trick, of course, in joining the wire to make a smooth circle, and a new gasket must be provided whenever the joint is reassembled.

Finally, there is the problem of true sliding joints and valves, which must be relied on for air locks to allow insertion of specimens and photographic plates without letting the whole complex interior of the microscope down to atmospheric pressure. And, by the way, a special type of gremlin gets into electron microscopes when they are let down to air. It spits and flies out again. The drool evaporates slowly for hours and hours during pumping, to the exasperation of the impatient engineer.

If opposing surfaces are ground sufficiently flat or tight—as in the case of glass stopcocks—and are smeared with a low vapor pressure grease—which is hard to get these days—the joint will be sufficiently vacuum-tight even during motion.

Of course, every time something is inserted through an air lock, air goes in with it. Sometimes a special pumping means is provided to evacuate the air lock between closing the outer seal and opening the inner seal. One reason is, of course, that a given quantity of air can be removed more quickly from a small volume, where the pressure is high—the air lock —than from a large volume where the pressure is low—the inside of the microscope. Pumps take a constant volume of air each revolution, not a constant quantity.

Photographic plates can be inserted through an air lock. Usually, they can be changed or a large plate can be moved, allowing exposures on several parts of it, completely inside the vacuum. This can be done by use of metal bellows called silphons, which are frequently used to move parts inside of evacuated chambers, or by levers through metal diaphragms, or even by well-ground greased bearings.

But even if all the joints are tight, the vacuum problem is not completely solved. Consider the focusing coils, the many interstices between the turns of wire. These are not easy to pump out if they are located inside the vacuum. One ingenious solution has been to inclose the coils in a vacuum-tight manner, making use of the iron flux path which surrounds the coil for this purpose. The gap between the pole pieces is filled with brass.

With the best efforts, the vacuum attained in an electron microscope isn't very good compared with that in a sealed off vacuum tube, for instance. This leads to several difficulties.

For one thing, in choosing a source for the electron flow about the only cathode which will stand up is pure tungsten. Thoriated tungsten, such as is used in some moderate power-transmitting tubes, and oxide coated cathodes, such as are used in receiving tubes, are out. This isn't so serious a limitation as one might expect, for aside from the power required to heat it, pure tungsten is a very good source of electrons.

A more serious problem is that many of the molecules in the "evacuated" microscope are complicated organic affairs. When these settle on the apertures of the electron lenses, they are bombarded by stray electrons. This cracks them, leaving behind a dense black coating which is a pretty good insulator. The coating charges up, and deflects or disturbs the electron beam, causing a loss of resolution. Then the pole pieces or electrodes must be taken out and machined clean or replaced. That's a reason for an easily demountable construction and for the associated vacuum seal problems mentioned earlier.

Electrically focused microscopes are more disturbed by insulating films than are magnetically focused microscopes. They suffer from another trouble from which magnetically focused microscopes are practically immune. In electrically focused instruments, the eletrodes in the lense are close together and have a high voltage between them. If the pressure falls during operation, or if the voltage is turned on before the instrument is sufficiently pumped down, there may be an arc between the electrodes, marring the polished surface and ruining the focusing properties.

One thing else which can ruin focusing in either an electrically or a magnetically focused microscope is stray magnetic fields. The earth's field causes deflections, huge compared with the deflections caused by the specimen. Stray fields from transformers, which can cause trouble even with a cathode ray tube, can make an electron microscope completely useless. But for a new need, new materials are available. Permalloy, a magnetic material developed originally for loading submarine cables, is just the thing. It has an especially high permiability for the weak fields against which the most vital parts of the microscope must be shielded.

Finally, there is the power supply problem. It's bad enough, of course, to have to supply sixty thousand volts along with adequate protective measures so that if a discharge should occur it won't do serious damage. Unfortunately, there's more trouble than just sixty thousand volts.

For correct focus, the electric and magnetic fields have to have the right relative strengths. In fact, the magnetic field is used as a focusing adjustment. Thus the voltage must not vary more than about 0.015 percent during observation, while the current in the objective coil must remain constant to within 0.007 percent.

To achieve the accurately regulated voltages required an ingenious high-frequency power supply is used. This, of course, means that small filter condensers can be used, and air-core transformers with fields against which the electron beam can be shielded easily. It also makes possible an ingenious voltage regulating means with a 30 kilovolt microscope power supply. A fraction of the output voltage is taken by a resistance divider and compared with the voltage of a battery. The difference is fed into a d-c amplifier whose output modulates the oscillator supply radio frequency power to the rectifier. Because of this "feedback," any lowering in output tends to increase the oscillator output; hence, a very constant output voltage is attained.

Added to these problems are what might be called "acts of God," and I will quote one example.

The cores of the focusing coils of magnetically focused microscopes are made of soft iron so as to retain little magnetism when the current in the coil is turned off or changed. Thus the strength of the lenses and hence the magnification is always the same for a given focusing current.

Ordinarily, then, a calibration can be made giving the magnification accurately in terms of the current. To do this a specimen is examined in a light microscope and some spacing is determined. Then the specimen is placed in the electron microscope at low magnification, so that the spacing spreads pretty well across the screen. This large spacing is then measured and so is some smaller spacing. Then the magnification is increased, the small spacing remeasured, and a still smaller spacing measured. The magnification is increased again, and so on, until a complete calibration is obtained.

Now once upon a time a microscope was made with a not so soft iron core. Nobody noticed this, and the microscope was sold to an astute physicist. He soon discovered that no correct calibration of magnification versus focusing current could be made—because the core of the focusing coil was a sort of changeable permanent magnet. But the physicist assumed that this was true of all microscopes.

Inspiration came. He found after months of research that he could produce little glass spheres and grade them by a flotation process so as to get quite a supply having practically the same diameters. Then he could include a few with his specimens and get the size of the interesting features of the

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specimens by comparison with the spheres.

Elated, the physicist published his work, and so it came to the attention of the microscope manufacturer, who supplied him with a new focusing coil.

With all these problems, it's no wonder that an electron microscope is not quickly or easily built. Considering all that has to go into it, it's no wonder that it is tall and heavy and expensive. When at a recent meeting of the American Physical Society Dr. K. K. Darrow, the secretary, called for bigger and better electron microscopes, he was promptly corrected. What people want is *smaller* and better electron microscopes. The electrons may be small enough, but the microscopes aren't. A smaller microscope would be cheaper, more portable, and easier to use. Moreover, if the vacuum chamber were small enough, air locks would not be needed; the whole chamber could be repumped quickly when let down to air for specimen or plate insertion.

What makes electron microscopes so long? Chiefly, the need for a long distance between object and image to get a high magnification. The Germans in an article published within the last year claim to have solved the problem of the smaller electron microscope by use of an electron mirror, or negative electrode, which reflects the electrons back along their path, thus doubling up on the use of vacuum space. But there's a simpler solution.

After all, the important thing in the microscope itself is resolving power, not just magnification. Photographic plates are available with a grain undetectable to the naked eye. Why not use a moderate magnification in the microscope, and enlarge the photographs ten to one hundred times before viewing them? RCA has used just this idea in making a new and compact microscope. The image is first viewed on a fine grain fluorescent screen placed at an angle in front of the operator. Then the plate is inserted just behind the screen and the photograph is taken.

Is there a way to make the electron microscope still simpler? Yes, there is. By using electric focusing fields only, the need for a well regulated power supply is eliminated. General Electric has microscope in which electrostatic focusing only is used. Another novel feature is that photographic plates are not inserted into the vacuum; instead the image is photographed directly from a very fine grained fluorescent screen by means of a detachable camera.

Undoubtedly the electrically focused microscope is simpler and cheaper than the magnetic microscope. So far, however, its resolving power has been inferior. But perhaps it will catch up! At any rate, the electron microscope has gone a long way toward becoming little enough.

THE END.

Book Reviews

THE GOLDEN ROOMS, by Vardis Fisher, Vanguard, $2.50.

A project for following the history of Man's progress from a near-ape, which began with the publication of "Darkness and the Deep," has had something of a setback in Vardis Fisher's second novel of primitive life, "The Golden Rooms." This should be qualified by saying that it is the scientific accuracy of the picture of ancient man which is at fault, not the author's ability as a writer.

"Darkness and the Deep" drew a repulsive but probably pretty accurate picture of the first stirrings of humanity in a race which was nearer to the apes than to Man. There was certainly nothing of the glorious Tarzan-modeled brute in these people—and the characters of the new book are just as realistically drawn, though they represent a higher stage, or rather two higher stages in Man's growing material and social culture. However, as one who is interested in archeology and anthropology, there are too many flaws in the picture for its accuracy to be accepted.

Mr. Fisher never states that he is showing us the familiar clash between the last Neanderthalers and the first Cro-Magnon men—two distinct species of Man with different cultures meeting head-on. However, the inference is distinctly that this is his setting, and the blurb on the jacket of the book says so. The race represented by Harg and his family are described as Neanderthal men would be described, and Gode's people have the physical characteristics of Cro-Magnon men.

The "golden rooms" of the story are the firelit caves of early Man, or the domes of light surrounding a fire in the open. The story is that of three great discoveries in the history of human progress: the control of fire—here made by Harg, the Neanderthaler — the beginnings of domestication of the dog, and on the mental side the first fear of ghosts. My complaint is that these three discoveries were certainly never crammed into the brief period represented by Mr. Fisher's book.

When Neanderthal man clashed with invading modern man in postglacial Europe he had a very respectable flint industry of his own which had spread over a great portion of the world—the Mousterian. He had had fire for thousands of years. He knew all about living in caves, and he buried his dead quite consistently in those caves. He was certainly not the brutish specimen, not far removed from the super-apes of "Darkness and the Dawn," which Mr. Fisher gives us in Harg.

On the other side of the conflict, the men—Cro-Magnons and others—who carried the so-called Aurignacian culture are not at all well represented by Gode's people. It is very doubtful that an Aurignacian hunter ever polished his stone tools as Gode does, or that his women purposely planted seeds to grow grain, or that they made even the crudest pottery—all of which are culture traits which do not appear generally for some thousands of years, in the transition between the Paleolithic and Neolithic stages. There is no proof that the first Aurignacians had the bow and arrow—the first Americans certainly didn't, at about the same time—but an author can be allowed to make his hero unusually enterprising, as in the business of half-taming a wolf. The picture of Aurignacian art is, on the other hand, extremely good.

We are told that Vardis Fisher plans six novels in this series, the last reaching into our own future. It is a series worth watching, for it strives to penetrate into the stirring mind of Man as he has grown in culture through the ages. "The Golden Rooms" fails because it has tried to encompass too much: it makes the late Neanderthaler too little like a man, and the first Cro-Magnons too much so. It presents as contemporaries an early stage of one culture and a late stage of the second, which is false in all respects if it is accepted as a generalization. There may have existed *a* Neanderthal family which had just learned to make fire at a time when *a* Cro-Magnon man was polishing stone, but if they existed and met neither was at all representative of his people and culture, and the picture we are given is therefore false.

If anyone is interested in the physical development of the present races of Man, "Mankind So Far," by Dr. William W. Howells of the American Museum of Natural History, is the most recent and readable comprehensive book I know. And for the general picture of the early civilizations, I can recommend a book by Ralph Turner, "The Great Cultural Traditions," which is particularly valuable for its time charts and abundant footnote references to the sources.

P. SCHUYLER MILLER.

DARKNESS AND THE DEEP, by Vardis Fisher, Vanguard. $2.50

There seems to be an unwritten law in the profession of science-fiction editing that from time to time the editor will buy and publish a story about cave men. I doubt that it is done to satisfy any clamoring public: the story, which is invariably short, runs somewhere near the bottom of the readers' ballot unless it is frankly and flagrantly divorced from any pretense of accuracy, and given over to blood, guts, and woman-beating. My own theory is that the editor does it for his own protection. Once the thing is in print, he can say to the next twenty hopefuls who show up with "The Adventures of Ug," "Sorry, we just ran one."

It is also a matter of compulsion for the best of writers to try their hand at the things at least once. H. G. Wells, as might be expected, did a vague and atmospheric honey; Jack London got away with it, and so did Stephen Vincent Benet. Some of these stories are good fiction and downright awful science; the rest may be accurate enough but no great shakes as stories. I choose to ignore, for the purposes of this commentary, those dearly beloved operas of the E. R. Burroughs school in which Ug and Wug mix it with dinosaurs, pterodactyls, and men from Mars.

Those of us who like stories about cave men for their own sake tend to be downright vicious in our criticism when a new one comes along, but when a scientist who can write persuades a publisher that he can sell a few copies, we beam and glow all over. When a writer has boned up sufficiently and been sufficiently cagey to avoid violating the holy tenets, we whoop and kick our heels. In neither case, I am sorry to say, does the publisher or the author make much money. The

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book-buying public prefers a cave man who resembles Johnny Weismuller and whose mate looks and acts like Carole Landis, to one who squats on his haunches in the rain and counts his toes.

"Darkness and the Deep," by the same Vardis Fisher who has written understandingly and well about the Mormons, is a full-sized novel about what for the sake of convention we will call cave men. Actually, there isn't a cave in the book. Wuh and Murah, his hero and chief heroine, lived at a time when the boundary between man and ape had not been very closely drawn. When they needed shelter, which was seldom, they pulled together nests of brush and grass, in a tree or on the ground, as gorillas and chimpanzees do today. They lived on leaves, roots, insects, eggs, and anything else their stomachs would accept and which they could find in their wanderings. They had vaguely defined family territories—as even our songbirds have—and roamed about in them as they exhausted the food supply in one place or another, or migrated when the food gave out. Murah, before the book is finished, is experimenting with what will probably be the beginnings of a spoken language, but for the race as a whole the only means of communication is in yells, grunts, and screams which convey emotions rather than ideas. Wuh himself stumbles across the possibilities of the club, and his family group comes close to realizing that co-operation can be a weapon against both man and nature.

This picture of our ancestors will be both startling and disturbing to some people, who sleep quietly in the assurance that many-greats grandpa at least wore leather diapers and was married to many-greats grandma by a priest of the sun. I am not enough of an anthropologist to say whether the picture the author has given us is trite or revolutionary: it is certainly new to what I know of cave-man fiction, and I have a feeling that it is very close to the probable truth. No other author, to my knowledge, has gone so far back toward the indefinable boundary between Man and ape, and at the same time made clear the germ that started Man on his climb toward Utopia. Mr. Fisher must have spent a great deal of time watching some of the great apes in their daily relations with each other, because Wuh and Murah and their kind, while the seed of humanity has been sown in them, are not much more than animals that walk erect.

"Darkness and the Deep" is the first of a shelf of novels, tracing the gradual evolution of the traits and qualities which we call human, from the days of Wuh and Murah to the mechanized savagery of today and on to a probable tomorrow. F. Britten Austin tried something of the sort in a series of short stories, but so far as I know it has never been attempted on so ambitious a scale and with so much promise of success.

P. SCHUYLER MILLER

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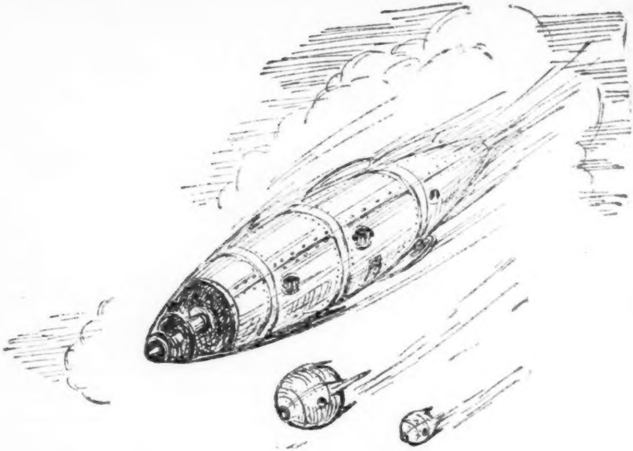


Brains for Bricks

by MALCOLM JAMESON

***Given** time enough, ants learn, even though, individually, they are almost brainless. They might—or a type like them might—rule a world, in time. But men have something worth while, too; brains have their advantages.*

Illustrated by Kramer

When next an Armadian ship came to Terra it was a gala day. This time it hove into sight escorted by a guard of honor; not harried and hounded by Terrestrian cruisers pecking futilely away at it out of their dread of the unknown. Now the world knew that the Armadian intentions were not hostile. They merely wanted that portion of the Solar System which Earthmen could not use themselves, and by way of recompense had sent an ambassador with a generous offer. If the Earth cruisers would quit attacking the Armadians engaged in mining the Red Spot on Jupiter and cede that planet and Saturn, the Terrestrians would be granted reciprocal rights in the Armadians' own bailiwick—the vast family of planets that swam about the sun Gol. It was this successful envoy whom the latest Armadian ship had come to pick up.

Ellwood, chief of the Bureau of Interplanetary Military Intelligence, better known simply as the boss bimmy, watched the proceedings with interest. He saw how cleverly the incoming ship maneuvered itself alongside the grounded wreck of the ambassadorial vessel. For the first visitor was a partial wreck, having been fatally holed by a zealous cruiser captain unaware of the peaceful mission on which it was bent. And Ellwood watched how deftly the alien monsters managed the transfer of their imprisoned ambassador from his refuge in the as yet intact control room. Pholor, for that was the name finally given by him, was about to go, bearing with him the perpetual treaty of amity and commerce which he and Ellwood so laboriously had contrived to negotiate. And then, to the roar of saluting batteries and amongst a display of flags, the alien ship was off—to bear back to Armadia the strange news. Two races, each detestable monsters in the other's eyes, had found common ground.

Ellwood turned away. He disregarded the flow of oratory still coming from the temporary platform where the political bigwigs were holding forth. It was his own infinite patience and sympathetic understanding that had made communication with these outside creatures possible, but those qualities were essential to the proper doing of his job. He took no credit for them and expected none. After all, his role had been that of a mere interpreter. The ultimate decision had had to rest with the Council.

He strode off toward the laboratory building. Already the posters were up proclaiming the millennium was at hand. Shortly, thanks to the wisdom of the Powers That Be, new and fairer worlds would be open to settlement. Pioneering expeditions were in preparation. In a few brief years congested, tired old Mother Earth would see her chicks begin emigrating to far off Golia, where virgin planets were. No longer were the mysterious alien ships to be dreaded. No longer would conservationists have to worry about the approaching exhaustion of the last mineral deposits. No longer would the population-control men quail at the sight of the latest census figures. On New Eden, as the unseen promised planet was already being called, such problems would not exist.

Ellwood's mind was not on those by-products of his efforts. They were in the hands of others. He still had work to do right where he was. His gang knew that too, for Darnhurst was waiting for him in his office.

"All right, fella, hop to it," said Ellwood, sensing the unspoken question, and getting at once to the point. "Let the politicians spout. Our job is only half done. Round up your men and go on into that control room and find out what all the gadgets are for. Pholor gave us the ship for whatever we could learn from it."

"Dynamic or static study, chief?"

"Both—in that order. But I warn you. You'll have to take precautions. Working conditions in there are not nice. It's hot—a thousand Fahrenheit, about. It's filled with stinking, poisonous gases at hellish pressures. And the grav plates are still putting out 3-Gs. You'll need to rig yourselves like I did or you'll pass out in nothing flat. But aside from that, the rest of it ought to be duck soup. Nothing was damaged in there."

"Yes, sir," grinned Darnhurst, and began punching call buttons on the order board.

After he left, Ellwood went down the hall to where Gonzales was working. As he passed the cadaver of the Armadian they had held back from dissection he paused a moment for a closer inspection of it. He was thankful that the Armadians appeared to have no respect for their dead, for Pholor had never intimated that he would like to carry away the bodies of the three killed by the hasty cruiser. This one would be an invaluable addition to the Bureau's museum.

As he regarded the sprawling remains of the—well, Thing—he could not fail to appreciate the horror the sight of it would inspire in the normal human being. There was no denying that the instinctive reaction would be revulsion. For it was grotesque, ugly—*incredible*. It lay there, an inert mass now, of armored sections from which sprouted strange appendages. It was as if some madman had dreamed up in a moment of a delirium a beast compounded in part of rhinoceri, octopuses, and armadillos, and ranged the segments in rows caterpillar fashion. For each plated segment rested on an elephantine monopod, and atop them were either nests of wide-ranging retractable tentacles, or else sets of weirdly shaped horns arranged as pentodes, triodes and diodes.

Ellwood wondered whether the psychomeds had made further progress while he had been engaged with Pholor. There were mysteries as yet unsolved. The Armadian was mouthless, eyeless, noseless, and earless. It had no alimentary tract. It subsisted on the vile mixture of ammonia-dominated air. It breathed through gills located beneath the segmental plates. It hunched itself around clumsily on its monopodial feet. It tended the intricate machinery of its ship with its many tentacles, each of which ended in some toollike terminal of horny growth. Some were capable of grasping, others cutting, punching, or exerting pressure. The body mechanics of the monsters, granting their queer metabolism, was fairly well understood. It was the nervous system that was baffling.

Perception came to an Armadian through his horns. Under their plates was a tangled mess of wirelike nerves, actuated by the radioactive salts abundant in their body fluids. Somehow they generated a queer sort of what can only be called *organic* radiation, similar to but different from ordinary radio waves or any other in the band of electromagnetic phenomena. They radiated those waves on a variety of frequencies from the antennae horns. and in turn interpreted their environment as they rebounded. Ellwood knew that much, and accepted it. What bothered him was that nowhere in the creature's structure was there anything analogous to a brain. There were only clotted ganglia arranged haphazardly throughout. Some were motor controlling, others sensorily interpretive. And there ended their capacity so far as any human knew.

Ellwood shrugged and walked on into Gonzales' room. His assistant was hunched over a microscope intent on something in its field while his fingers played incessantly on the buttons of a small testing box. Meter needles quivered as oscillating currents surged back and forth. But at Ellwood's footfall Gonzales sat back and flicked off the juice.

"What luck?" asked Ellwood.

"Still looking for a brain. They just haven't any, that's all. It's a screwy thing to say, but that is the way it is."

"Humph," frowned Ellwood. "It doesn't fit. They have memory, for they have been coming here at intervals for fifty years, and after the first visit confined their attentions to Jupiter, knowing the inner planets were unsuitable for them. They also remembered our many futile attacks on them. That is why they wanted to reach an understanding."

"That may be," shrugged Gonzales, "but now that you bring it up, how much memory does a young salmon have when she first goes to spawn? Yet she unerringly finds the proper place, though no fish is heavily endowed with thinking matter. No, I have examined this stuff over and over. There is no seat of reason. There are only reflexes. Highly intricates ones, yes, but reflexes."

Ellwood picked up a handful of the shredded stuff on the table. It was the remnants of an involved lump of nerve ganglia.

"Shoot amps enough into that," went on Gonzales, "and follow through, and it comes to life. In its essence it is a sort of radar. But it reports. It doesn't think. And it is the biggest and the most complicated of all the Armadian ganglia. Armadians do what they do like a bird builds her nest or a cobra spits venom—by a sort of super instinct. You needn't tell me that because they have space-spanning power ships jammed with crazy machinery that they have to be reasoning beings. I can't find any histological evidence to support the view. What they do is largely automatic."

"Nonsense," said Ellwood, a little testily, recalling the fine spirit displayed by Pholor. "They do reason, as was evidenced by Pholor's coming here at grave risk to himself. He wanted us to stop our senseless attacks on his ships, and at the same time realized we would expect some inducement. There you have not only memory, but foresight and logic. I even got a clear impression that the Armadians have what we call a sense of honor."

"The sense of honor," said Gonzales, dryly, "waits on the future to be proved. As to memory, foresight, and logic I merely suggest to you the well-known phenomenon known as symbiosis. Is the three-way partnership reputed to prevail among owls, prairie dogs and rattlesnakes the result of logically arrived at treaties? Or the relations between sharks and pilot fishes? Or those between ants and aphids? In their queer way these Armadians appreciate that we are no threat to them, though something of a bother. Who knows? Perhaps elsewhere in the galaxy they have experimented with co-operation and found that it pays better than strife. They sensed the same possibilities here and reacted. To me it is no more mysterious than that."

"I don't know," said Ellwood slowly. "Pholor *showed* me—through his marvelous telepathic power—their high civilization, their immense heavy industries, their knowledge of atomics. I can't believe it is just instinct."

Gonzales laughed, for he saw the chief was shaken, despite his stand.

"Consider the lowly ant, boss. With lots less on the ball it has managed a pretty intricate social order too, and one that has lasted down through eons of perpetual adaptation by the rest of us so-called higher beings. Who are we to be scornful? Where are the dinosaurs today? Or Babylon, Rome, or a score of other perfected civilizations? The ant is a pragmatic creature. He found what worked, and stuck to it, dumbly if you please, but the ant endures. Yet we, vain with our sharp critical ability and ever itching to move on to loftier heights, tear down as fast as we build. If history means anything at all, it is that man is doomed by his own restless intellect to a succession of cycles. We go up, we go down, we get nowhere. That is what reasoning and your precious logic does for you."

It was Ellwood's turn to grin. Gonzales was a fellow with a philosophy all his own. This sort of thing could go on all afternoon. Ellwood was just about to break off and go when an annunciator began howling. Darnhurst was paging him.

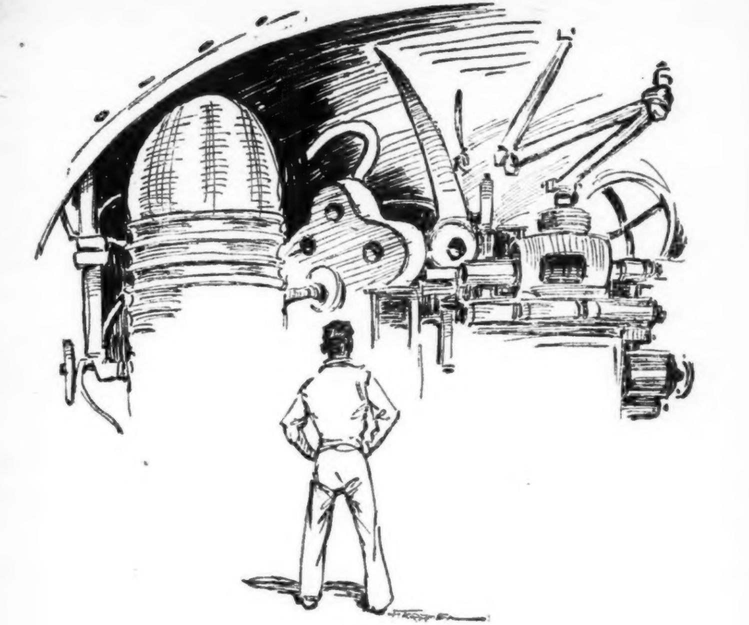
"Yes, Darnhurst?"

"Better come down to the ship, chief. We've run into trouble in bunches."

Darnhurst did not exaggerate. Ellwood went, and he saw.

"No," he said, "this won't do. You've got to do it the hard way."

A hard way it was. One exasperating week of mankilling work followed another; the season waned and its successor came in before the bimmy gang satisfied its exacting chief that all had been learned about the Armadian spaceship. Where Darnhurst fell down in the beginning was in trying to ameliorate the conditions under which they must work. It proved to be impossible except for one detail. They found they could cut the artificial gravity



down from 3-Gs to Earth normal. Every other effort at comfort failed.

The first had been the withdrawal of the noxious superheated Armadian gases and the substitution of air. At once hot metals that had never been exposed to the element before began oxidizing at an alarming rate. Unless oxygen was kept away there shortly would be no machines to study. So the ammonia-methane - phosgene combination went back in. Nor was it possible to reduce its temperature. It was discovered that the lubricants favored most by the Armadians were metals such as tin and lead. At temperatures tolerable to the bimmies these congealed and the machines froze. In like manner it was learned that pressures had to be maintained. Many of the Armadian valves were controlled by barystats which operated as the pressures rose or fell about the mean, and that mean was high. When pressures were allowed to fall appreciably some of the stats began to swell, two of them bursting and spewing mercury vapor into the room.

Those were preliminary discoveries. Then a week after the beginning Darnhurst put in a hurry call for a dozen more men.

"Why so many?" asked Ellwood. "You have eight of our best."

"Chief," said Darnhurst wearily, "an Armadian is like an old-fashioned pipe-organ player. When he works on his instrument he uses everything he's got—both hands, both feet, both eyes and both ears. Well, that's the way these Armadian machines are set up. Those babies have twenty tentacles with an over-all spread of around forty feet and the one that used to operate that ammonia purifying gadget used every one of them all the time. It takes a lot of men scattered all over the ship to take his place."

"I see," said Ellwood, and O.K.'d the chit for the extra men. He also visited the ship the next day to see them in action. Darnhurst was putting the purifier through its paces.

"You, over there," he called through his helmet phone. "That thing you've got the jack against is a regulator for the methane flow just before it enters the mixer. When the monsters wanted less of the stuff they just got hold of it and squeezed, see? O.K., squeeze now while Jim and Freddie work those things across the room."

"I need a heavier jack," panted the man after a brief exertion. "Wow, what a grip those animals must have!"

The experience with the purifier was typical. The machine controls roamed like climbing vines all over the walls and overhead. The simplest operating adjustments often required simultaneous action at widely separated points. Mechanically speaking the vessel was a surrealistic dream.

But there came a day when the dynamic study was completed, and it was permissible to cool the ship off and drain the foul atmosphere. After that the relieved bimmies proceeded to dismantle the parts and examine them in detail. What they discovered amazed them.

"This is getting me down," said Darnhurst at one of the conferences. "The principles behind these machines are simply wonderful—far in advance of much of our own science. The material is marvelous—alloys that are tailormade. The workmanship—well, it's just beautiful. The stuff could be sold as jewelry. Yet the allover design stinks. There is no other word for it."

"That's what happens," drawled Gonzales, "when brainless creatures go in for invention. I keep telling you they think with their reflexes."

"We won't start that again," ruled Ellwood. "What we do next is redesign the whole show, and we'll do it in duplicate. One ship will be strictly up to Armadian specifications, but simplified. The other will be for our use, using the principles we have discovered but substituting air for ammonia, and so on. Get going."

It took months more to build the two vessels. Ellwood immersed himself deeply in the collateral problems, turning all other routine over to assistants. From time to time rumors drifted to the lab of the hubbub in the world at large, but they made little impression. A new program had been formulated known as the Ten Year Plan, and all the industry of Earth was a beehive of activity. Space transports were being laid down on a colossal scale to be in readiness for the day when the waves of emigration would begin. Population control experts roamed the five continents selecting the favored ones who were to make up the first billion. The talk was all about New Eden and the paradise that was to be there. But Elwood and his bimmy gang stuck to their knitting. It was an age of specialties, and they had their own row to hoe.

At last came the day when the two ships were ready for their trials. The human edition was a beauty, slicker and faster than anything known, and as handy as a bicycle. It embodies the best features of Armadian science and construction, coupled with the best of Terrestrian design. The Golian version was an equally good ship—for an Armadian—and the most startling feature of it was its apparent emptiness. The complicated controls had been reduced drastically and made largely automatic. Where twenty operations had been required before now only one was needed—a jab at a stud or the flick of a switch. Bulk had been cut to one quarter. There was now room for additional auxiliaries that Ellwood assumed had been crowded out before. He had a few built and added.

It was well his work came to completion when it did. The day the ships' name plates were affixed there came an urgent message from the director general.

"How long will it take you to get out to New Eden?" he inquired anxiously over the telecom.

"A month I'd say. There are a lot of parsecs in between."

"You are leaving at once," said the director. "Take any ship you please, but get going. We are getting disturbing messages from the Relocation Committee out there."

"Trouble with the Armadians?"

"That's what I want to find out," snapped the director. "That fellow Crawford is too vague. All we know is that he keeps saying the Ten Year Plan is unworkable."

"I'm practically on my way," replied Ellwood, and snicked off the connection.

From afar the Golian System presented a gorgeous spectacle. About a blazing sun swam forty mighty planets and a number of lesser ones. Armadia was one, and Trusch, and Ukor, and Linh, the last two being ringed like Saturn. Great Trusch, four times the size of Jupiter, carried along with her a system of her own, a myriad of varicolored satellites. And finally there was New Eden and the five other lesser orbs allotted to the men of Earth. They were bluish, and also had moons, those pertaining to New Eden numbering three.

Ellwood headed his new ship toward his planetfall, the *Golite,* its Armadian counterpart, trailing behind under remote control. Twice stubby nosed Armadian scout cruisers zipped by, looking him over, but except for the agreed upon exchange of recognition signals had nothing to say. And then Ellwood was spirally down into the clean atmosphere of fair New Eden.

He circled the planet twice in order to see it whole. It had not been misrepresented. It was well watered, but there were no vast wastes of ocean as the Pacific. Nor were there sprawling continents covering a hemisphere. It was an oceanic planet studded with many large islands, each with its rich lowland plains and its cool plateaus. There were rivers and lakes and islets galore, but no deserts, and the polar caps were small. Ellwood crossed the island known as Valhalla, and after that Paradise, flying low. He saw sky fields being prepared, and the tents of surveyors who were laying out the future cities. And then he was over New Eden proper, where the planetary capital was to be. He spotted the temporary barracks and the flagstaff that marked the place of administration, and landed in a field nearby after first guiding the *Golite* to its berth.

As he stepped out into the open he *knew* that this was heaven. The very first breath was exhilarating, and his quick step took on some of the characteristics of a prance. For oddly, though the gravity was a trifle less than that on Earth, the oxygen content of the air was a little richer. The combination, together with the crisp, cool air, made him feel a new being altogether—at once strong and full of vigor, yet light and airy as a sprite. But his exuberation was soon to be dampened. In Crawford he found a dispirited man.

The executive chairman of the Relocation Committee wiped the gloom off his face only long enough to offer a perfunctory greeting, and then dejectedly waved Ellwood to chair.

"I'm told you're a whiz as a trouble shooter," said Crawford, glumly. "You'd have to be. We're getting nowhere fast here."

Ellwood waited, but Crawford was staring out the window.

"Don't the Armadians co-operate?"

"Oh, bother the Armadians," said Crawford, irritably. "How would I know? Yammer, yammer, yammer. Then they run away. Those codes you wrote into the treaty just don't work. Or something. Gibberish is what they send, and then they seem to get angry. We can't make 'em out, and the young fellows I send to Neutralia are afraid of them. We haven't a soul there now."

"Neutralia?"

"Yes—the medium-sized planet they set aside for our two legations. It isn't comfortable there for either one of us, but our envoys can live under domes and confer."

Ellwood felt a letdown. He was astonished that the code he and Pholor worked out had failed, so he pressed the point.

"Oh, some messages got through, though badly garbled," admitted

Crawford, "but their demands are impossible. They say you promised commerce and they want to begin. But what demands! They can't use our lumber or plastics or textiles; they would go up in a puff in their temperatures. All they want is metals."

"Well?"

"It's the quantities," sighed Crawford. "They think in terms of millions. They offer a cubic mile or so of gold, or anything else they have lots of, but here's what they want in exchange . . . lemme find the memo . . . oh, half a million tons of tungsten, ditto iridium, ditto uranium bricks, and so on. There just isn't that much stuff; not anywhere. And anyway, we're still in the pioneering stage here, which as you will see is bad enough without complicating it with the crazy demands of the Armadians.

Ellwood did not break the soggy silence that followed.

"The real trouble is at home," resumed Crawford, finally. "They have a bunch of dreamy optimists in charge and out of it comes the Ten Year Plan. I'm the guy that has to carry out this end of it. It's impossible, that's all."

"That word," said Ellwood, cheerfully, "is not familiar to me. In our labs we frown on it. I prefer 'tough' myself."

"Listen," snorted Crawford, "and then repeat that."

Elwood listened, unsympathetically at first, for he had sized up the man before him as a prime defeatist. But as Crawford dismally

WRITING ON THE ROCK

When Doc Savage started on that South American junket, he only knew that two redheaded girls had flown a long way just to get his help.

Besides that, he didn't like the idea of somebody getting threatening phone calls from a guy who lisped.

That was why he walked into a trap with his eyes wide open!

Doc and the boys juggle a keg of international dynamite in ROCK SINISTER. Be sure to get the May issue of

DOC SAVAGE

AT ALL NEWSSTANDS

unfolded his tale Ellwood's respect for him rose. The fellow *was* holding the heavy end of the stick.

"The catch is," concluded Crawford, "that they want a perfect civilization set up before the first batch of colonists arrive. That entails plenty, because the emphasis is on the 'perfect.' There are to be no slums—ever. The cities are to be ready to move into when the immigrants arrive, which same goes for all the accessories—mining, agriculture, industry, transportation and research. All those facilities have to be exactly balanced as well. And my committee has to do it with what we've got without help from home, and be finished in time.

"Very well, so much for the program. The preliminary work is largely done, as I have an army of engineers to help me. But let's list the needs, and check off what we've done in this first two years.

"First of all we had to know what we had to work with, which means surveys. Our geodicists have mapped the place and sounded the oceans. Our geologists have a picture of the subterrane for ten miles down, and I can tell you this planet has everything—coal, oil, metals, what you will, with reserves for centuries. The crop experts have planted experimental farms and know what to expect from the soil. The planet is fertile. The transportation sharks are doping out the highway, seaway and skyway routes and have begun laying out terminals. Our astronomers—"

Crawford broke off and smiled a doleful smile.

"Say," he said wryly, "can you imagine having to dope out a strange solar system lousy with planets and moons and comets in less than two years? We haven't completed our first circuit of Gol yet, but they have a calendar. Or a tentative one. We also now possess what are laughingly called tide tables, but with three moons to contend with they are going to have to be revised."

"I think you have done remarkably well," commented Ellwood.

"So far, perhaps. It is the next step where the shoe pinches. Pretty soon we'll have to start construction, but what with? Cities to house a billion people call for a lot of bricks and steel, not to mention the heavy machinery for industry. I yell for material and the Council comes back and says I have everything here, use it."

"I see," grinned Ellwood. "Smelt your own ore and roll your own steel from what's here."

"Yes. But what do I sink the first shaft with, or drill the first oil well? They won't send me ore stamps or drill rigs because Earth industry is working two hundred percent capacity building spaceships. A billion people take a lot of transport even if you do spread 'em out over the last five years of the Plan. So they say it's my problem. I've got the egg—produce the chicken. Wangle what you need from the Armadians."

Again he smiled wanly. "Except," he added, "it isn't as easy as that. To hatch your egg you have to set a hen on it."

It was a curious dilemma, and no

fault of Crawford's. The authors of the Ten Year Plan had been over optimistic. If a billion persons and their baggage were to be shipped across the galaxy in the last five years of it, every ounce of Terrestrian production would have to be devoted to ship construction in the meantime. No help for New Eden could be expected from Earth. Yet for all its rich resources, the new planet was stymied for lack of machines. Once the ball of production was started rolling, trade was possible with nearby Armadia. Until then Crawford was in much the position of a hungry man on a raft laden with canned goods but without an opener.

"I think I'll take a run over to Neutralia and ask them to send for Pholor," announced Ellwood.

"You won't get far there," said Crawford, dismally. "The monsters seem to be sore about something. Anyway, what have you got to offer?"

"Brains," was Ellwood's cryptic response.

He parked his two ships beside the cluster of ambassadorial domes and waited for Pholor to come. In those few days he had time to think the problem through. There were several ticklish aspects.

Ellwood shrewdly suspected that the reason the other envoys failed was due to their mutual distrust of types so alien. The human envoys insisted on using radio code for conversation, and the nature of the waves was such as to jar the delicate nerves of the heavy-world creatures. On the other hand, it was a good deal to expect of an ordinary man that he would willingly surrender his mind to the semihypnotic telepathic control of a beast as bizarre and repellant as an Armadian. Moreover, the compromise done in which they conferred was uncomfortable to both parties. Elwood would leap that hurdle by going straight into the Armadian dome, for he had brought his special armor and heavy chair with him. He knew that thus shielded he could stand the Armadian environment, and he had already gone through the brain-searing ordeal of becoming neurally attuned to Pholor's mentality.

He was much less sure of his bargaining position. From one of the men who had attempted intercourse with the Armadian emissaries he learned a little of what was behind the present impasse. The ammonia breathers also had something analogous to the Ten Year Plan, and their ambitions far outreached their capacity to produce. They were in as big a hurry to develop Saturn and Jupiter as the Council was to colonize New Eden. Therefore it was imports of hard metals they wanted now in exchange for an equal tonnage of gold which was plentiful with them but of little use. Ellwood's informant also said he was given to understand that there was a good deal of dissatisfaction with Pholor's treaty. Armadian hotheads were declaring that it would have been better to exterminate the Terrestrians and have done with it, rather than pay for planets they could have had for the taking. To cede still others close to home was an outrage.

Besides this bad start, Ellwood was growingly aware of still another difficulty he was going to have to face. He had taken upon himself the task of talking Pholor out of the very thing he wanted—immense quantities of structural material and heavy machines—in exchange for nothing more tangible than ideas. He foresaw that the negotiations were likely to be tricky; a good salesman does not show all his hand at once. But in human intercourse a man is not compelled to reveal more than he chooses. In full psychic communion it was going to be hard to keep the hole card face down.

Ellwood devised a neural scanner, utilizing principles he had learned from the dissection of the dead Armadians. Then he pitted himself against it, setting up thought blocks and comparing them with the resultant records. The first results were disappointing. His efforts to hold back certain thoughts served only to emphasize them. But by the time Pholor arrived Ellwood had hit upon a system. He imagined in advance every conceivable question that might be put to him, and then thought out his answers. Those he keyed with appropriate cues, committed them to memory, and then deliberately trained himself to forget them. It called for the most strenuous mental effort, but in the end he felt relatively safe. Whatever he was to say was now buried deep in his subconscious mind, locked away until the appropriate question should recall it to the field of awareness.

Ellwood and Pholor met in the latter's embassy. The reunion was cordial enough, for the two disparate creatures had deep respect for each other, but Ellwood was quick to sense a new coldness. Pholor was not going to be as genially receptive as in their previous dealings.

"Observe," smiled Ellwood, easily, "the present I have brought you."

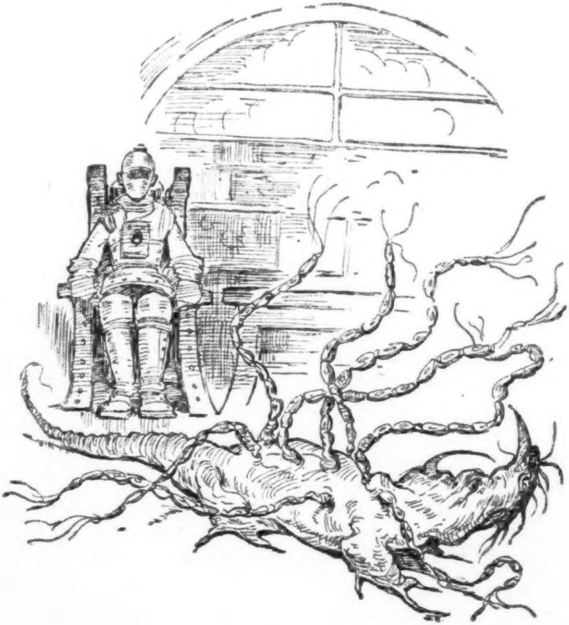
He directed Pholor's perceptions toward the little *Golite,* the bimmy designed ship for Armadian use. It lay within easy range of the Armadian's radarlike senses, and from where he sprawled on the dome floor he could examine it with his neural tentacles, fingering first one bit of Earth designed equipment and another. Ellwood followed his reactions with intense interest.

The initial response was quite different from what he was expecting. It was wholly negative. There was neither admiration nor delight, but a sort of baffled wonder. And then the wonder swiftly degenerated into a mixture of suspicion and distaste.

"What trick is this?" Pholor's sharp thought snapped over. "What controls these paltry toy machines? Except for a few buttons there is no place to lay a tentacle. What you have brought and call a present is a mockery. It is useless. It looks dangerous. Is this what you have to trade?"

It was like a dash of ice water. The superb design done by his experts was wholly lost on the stumpy, plated monster. Ellwood felt already that Pholor's mind was quitting the ship, having dismissed it as of no possible value. Desperately he summoned his most persuasive thoughts. He brought Pholor back mentally to the control room and went over each of the machines, explaining why the changes had been made. Why, in the interests of efficiency, they *had* to be made. Pholor remained unimpressed, but was finally persuaded to enter the ship.

The original Armadian design had been ridiculously complicated; the human version was a gem of compactness. One machine was the master barystat. It registered the prevailing gravitic influences and automatically adjusted every other machine. It maintained the inside gravity at 3-Gs, regardless of the nature of what was outside. It regulated the repulsors, so that they would develop just what power was needed to lift from any planet. It reported masses of all sizes in the vicinity and actuated the meteor deflectors. A single stud controlled it. It was either off or on. There was also a computer, which not only worked out from given co-ordinates



the optimum trajectory between two points, but took care of deviations caused by stray bodies met in space. There were compressors and purifiers, all much simplified.

The control board was like none in human use. There were no dials, no name plates, no meters, no warning lights or buzzers. Armadians did not need them, being without sight or hearing. Through their curious means of perception they *knew* what current surged through a given circuit at a particular moment, and could appraise the fluctuating magnetic and electric fields. On the *Golite's* panel there was a single master button that would turn everything on or off at once, and there was a single cutout for each auxiliary.

"Here," transmitted Ellwood, punching in co-ordinates on the computer, "I'm laying out a triangular course—we will circumnavigate Gol itself, angling off to come back in from behind Trusch. Once I set this it will take care of everything. Now I press the take-off button."

He felt Pholor's thoughts upon him, stolidly noncommittal. Then, as the ship soared away, there was a wave of distinct fear. Pholor was undergoing all the agonies of a backseat driver. Where normally his tentacles would be darting yards across the room to adjust this or tinker with that, there was nothing now to do. The automatics were doing it. The jangled tentacles twitched and coiled spasmodically. Pholor was not happy.

Then he grew calmer. At first it was a sort of resignation, but gradually he began to observe that the barystats, bolometers and other data takers were still feeding their machines and the machines were responding nicely to every trifling variation. Yet Ellwood had not touched the panel since the start-off.

"It works," came an awed thought from Pholor, a reluctant thought and one not fully believed in. "I can't understand it."

Ellwood tried to explain. Pholor tried hard to understand. Neither succeeded. They were already around Gol and on the second leg when Ellwood gave up in sheer exhaustion. He laid back in his heavy chair and tried to conjure up another approach.

He knew by then that Gonzales was right. Armadians did not think. They reacted. The results of trial and error they could recognize, abstract principles befuddled them. Their science was strictly empirical; there was nothing analytical about it. Instinct, intuition and blind groping explained their seeming culture. Automatic controls were beyond Pholor's comprehension. Where there is no capacity for logic there can be no concept of efficiency. Improvement to an Armadian meant building more and bigger models of what he had already found to work. Ellwood resolved to take a drastically different tack.

"Among my people," he sent, "when we find something that works but do not know why, we call it magic, and accept it. It is a very potent principle. This is a magic ship. Yet having it, you can re-model every ship you own. The savings in metal and the gain in space will be enormous. In exchange, we expect you to deliver to us one half the savings."

"Your magic is good," agreed Pholor after a time, "and I will take your present and be thankful. It will serve to placate those of my kind who are denouncing the treaty. But they will never consent to exporting the savings. We need every ton."

Ellwood was dismayed. He floundered for a moment and then came up with yet another idea. Spatial motive power was only one form of machinery.

"Take me on a mental tour again of all your industrial plants."

Pholor assented, and instantly Ellwood was launched again on a weird voyage to strange, big planets, traveling by proxy through the wide ranging perceptions of the other. As in a dream he inspected machines in mighty shops where the crushing drag of gravity would be fatal to a man in the flesh. What he saw confirmed his suppositions. All were as crudely designed as the stuff in the envoy's ship. Redesign would result in untold savings.

"Now show me your mines," asked Ellwood.

Here was a real surprise. Armadian mines were surface strip mines, and remarkably few in number. Ellwood was puzzled for a moment as to why planets larger in bulk than the sum of all Earth-controlled ones should have such meager ore supplies. And then he hit upon a double-barreled explanation. First,

EYES IN THE NIGHT

He kept seeing eyes—gray eyes—staring at him relentlessly. That was after he'd gotten out of the sanitarium and they'd told him he was cured.

Then one night he saw another pair of eyes in the prettiest face he'd ever seen—a face hauntingly familiar. Where had he seen her before? What was the secret of his past?

The Shadow plays one of his most thrilling parts in following the intricate pattern of a forgotten past. Read DEATH HAS GRAY EYES in the April issue of

THE SHADOW

AT ALL NEWSSTANDS

the large planet's heavy masses held back more of the lighter elements which the lesser planets tended to lose into space. Their surfaces therefore would run more to rock and less to iron. But the real key was in the Armadian mental habits. Not being a contemplative race they were not likely to ever develop a theory of geology. It would not occur to them that there were buried ore deposits, and had not looked for them.

"I have seen enough," announced Ellwood. "Let's get back to the dome."

Before he left he bore with him a codicil to the treaty. It gave all he asked and more.

"What luck?" asked Crawford, gloomily, as Ellwood strode into his office. There was no hope in his expression.

"It's in the bag," grinned Ellwood. "You'll get your stuff when and where you want it, delivered jobside. It'll be prefabricated, too."

"What! No, don't kid me. It's no joking matter."

"I mean it."

"All right," Crawford simply could not cheer up. "What's the catch?"

"What do *you* pay? Not too much. You assign me at once a couple of hundred of your smartest engineers and model makers, with shops and foundries to work in. I could use a geologist or so, too. I want our neocosmic radiant geoprobes rebuilt for Armadian use."

"I don't get it," said Crawford. "We can't send men onto Armadia and Trusch. They'd die."

"We aren't. We just send along their brain throbs. It is going to work this way — Armadia will shortly ship us specimens of all their machines. We redesign them and ship the models back. Blueprints and specifications won't do. They'd burn up. We will send them the geoprobes so they can uncover subsurface deposits they never dreamed were there. And along with it we send samples of the girders and trusses and forges you want so they can get busy on manufacture."

"But," objected Crawford, "they insist on payment in metal. We haven't any."

"Oh, yes we have. Billions of potential tons of it in savings as they retool, not to speak of what is still in the ground. And it has already been delivered by me. We get back half."

"You're either delirious," said Crawford, staring at him, "or you've been pulling magic—"

"Magic," said Ellwood, grinning still wider, "is just what I used. I turned brains into bricks, and a fair swap is no robbery."

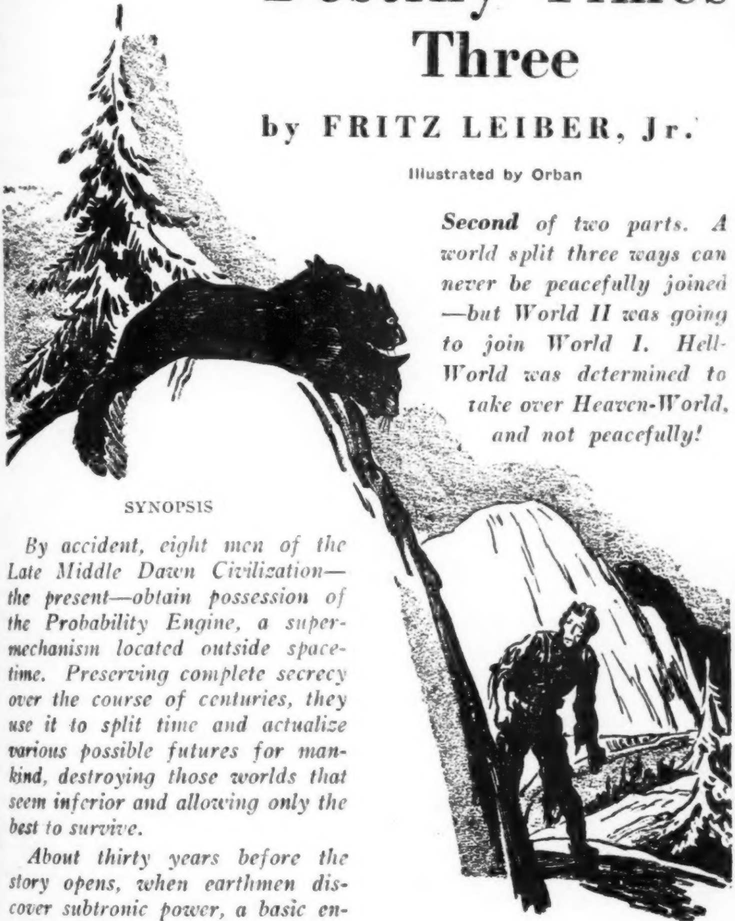
THE END.

Destiny Times Three

by FRITZ LEIBER, Jr.

Illustrated by Orban

Second of two parts. A world split three ways can never be peacefully joined—but World II was going to join World I. Hell-World was determined to take over Heaven-World, and not peacefully!



SYNOPSIS

By accident, eight men of the Late Middle Dawn Civilization—the present—obtain possession of the Probability Engine, a super-mechanism located outside space-time. Preserving complete secrecy over the course of centuries, they use it to split time and actualize various possible futures for mankind, destroying those worlds that seem inferior and allowing only the best to survive.

About thirty years before the story opens, when earthmen discover subtronic power, a basic energy underlying gravity, magnetism, and electricity, the Great Experimenters again interfere with human destiny. They actualize three worlds. In World I, subtronic power is made public property. In World II, it becomes the prized weapon of a ruling elite. In World III, an attempt is made to eradicate the discovery.

After a time they decide that I is

the best choice and destroy II and III—they think. Only one Experimenter, the rebel Oktav, guesses the truth—that they have not destroyed the botched worlds, but only cut them adrift from the main-trunk time-stream.

World II, become a totalitarian tyranny bossed by "the Servants of the People," discovers the existence of the free and utopian World I and builds a transtime machine for purposes of invasion. Two of the Servants, Conjerly and Tempelmar, force mind-exchanges with their duplicates, who are members of the World Executive Committee in World I.

Other infiltrants into World I include Recalcitrants—rebels against the tyranny of the Servants.

Oktav attempts to warn World I of the danger without giving away too much. Posing as a fortuneteller, he makes disturbing hints and prophecies.

Partly under his influence, two, psychologists of World I, Clawly and Thorn, get a line on what is happening and attempt to warn the world of its danger. They fail to impress the World Executive Committee.

Thorn disappears. Clawly, in a last desperate effort to arouse the world to a state of alertness, fakes the threat of a Martian invasion, with the aid of Firemoor, chief of the Extraterrestrial Patrol.

Thorn has been displaced by his duplicate in World II—Thorn II, a Recalcitrant leader. Trapped in the body of Thorn II, Thorn I is hunted down by the agents of the Servants of the People. Leader of these agents is Clawly II, duplicate of his friend in World I, but here his greatest enemy.

Thorn I is taken to the Servants. They realize that his is a displaced mind from World I and decide he must be killed. Under the psychological pressure of the death-threat, Thorn's mind is once again displaced. He has in his possession a small gray sphere, which he stole from Oktav while under a mysterious hypnotic influence.

X.

Three roots there are that three
ways run
'Neath the ash-tree Yggdrasil;
'Neath the first lives Hel, 'neath
the second the frost giants,
'Neath the last are the lands of men.
Elder Edda

Thorn did not ask himself why his resting place was dark and stuffy, rocky and dry, or where the stale, sour smell of woodsmoke came from. He was content to lie there and let his mind snuggle down into his body, lull itself with simple sensations, forget the reverberations of its terrible journey. World II still clung to him sluggishly. But like a nightmare from which one has wakened, it could be disregarded.

In a moment he would rouse himself and do what must be done. In a moment, he knew, he would know no peace until the warning had been given and all essential steps taken, until the invasion had been met and decisively thrown back. He would be a creature of tension, of duty, of war.

But for the moment nothing mattered, nothing could break his sense of peace.

Odd, though, that the heavy woodsmoke did not make him cough, and that his body was not aching from its cramped position and rocky crouch.

Muffledly, as if its source were underground, came a distant howling, melancholy and long-drawn-out, ending on a low note of menace.

He started up. His shielding hand encountered a low ceiling of rock, hurriedly traced it to jagged, sloping walls on either side.

It was he that was underground, not the howling.

What the devil had Thorn II been doing in a cave in World I? Why was he wearing this odd jumble of heavy clothing, that seemed to include thick, stiff boots and furs? Where had he gotten the long knife that was stuck in his belt?

The cramping darkness was suddenly full of threats. In panicky haste he continued his feeling-out of the walls, found that he was in a small domed chamber, high enough in the center so that he could almost stand upright. On three sides the walls extended down to the uneven floor, or to the mouths of horizontal crevices too narrow to stick more than an arm in.

On the fourth side was a low opening. By getting down on hands and knees he could wriggle in.

It led slightly upward. The smell of woodsmoke grew heavier. After two sharp turns, where jagged edges caught but did not tear his heavy clothing, he began to see the gray gleam of daylight.

The roof of the passageway grew higher, so that he could almost walk upright. Then it suddenly opened into a larger chamber, the other end of which was completely open to a gloomy landscape.

This landscape consisted of a steep hillside of granite boulders and wind-warped pines, all patched with snow. At a middle distance, as if across a ravine.

But Thorn did not inspect it closely, for he was looking chiefly at the fire blocking the mouth of the narrow passageway, sending up smoke that billowed back from the ceiling, making the day even more gloomy and dim.

It immediately struck him as being a very remarkable fire, though he couldn't say why. After a while he decided that it was because it had been very cleverly constructed to burn steadily for a long time, some of the logs and branches being so placed that they would not fall into the fire until others had been consumed. Whoever had built that fire must have painstakingly visualized just how it was going to burn over a period of several hours.

But why should he waste time admiring a fire? He kicked it aside with the clumsy boots Thorn II had dug up God knows where, and strode to the mouth of the cave.

Claws skirred on rock, and he had the impression of a lithe furry animal whisking off to one side.

The cave opened on a hillside,

similar to the one opposite and slanting down to a twisting, ice-choked stream. Overhead a gray, dreary sky seemed to be trending toward nightfall. The walls of the ravine shut off any more distant horizon. It was very cold.

The scene was hauntingly familiar.

Had Thorn II been insane, or gone insane? Why else should he have hidden himself in a cave in a near-arctic wild-life reserve? For that certainly seemed to be what he had done, despite the difficulty in picturing just how he had managed to do it in so short a time.

A fine thing if, after getting back to his rightful world, he should starve to death in a reserve, or be killed by some of the formidable animals with which they were stocked.

He must climb the hill behind him. Wherever he was, he'd be able to sight a beacon or skylon from its top.

It suddenly occurred to him that this ravine was devilishly like one in the woodland near the symchromy amphitheater, a ravine in which he and Clawly used to go exploring when they were boys. There was something unforgettably distinctive about the pattern of the streambed.

But that couldn't be. The weather was all wrong. And that ravine was much more thickly wooded. Besides, erosion patterns were always repeating themselves.

He started to examine the queer, bulky clothing Thorn II had been wearing. In doing so, he got one good look at his hands—and stopped.

He stood for a long moment with his eyes closed. Even when soft paws pattered warily somewhere over his head and a bit of gravel came trickling down, he did not jerk.

Rapidly the determination grew in his mind that he must get to the hilltop and establish his position before he did anything else, before he thought anything else, certainly before he examined his hands or his face more closely. It was more a terror-inspired compulsion than a determination. He stepped to the rocky lip in front of the cave, and looked back. Again there was the impression of a gray, furry animal streaking for cover. Something about the size of a cat. He hurriedly surveyed the routes leading upward, picked one that seemed to slope more gradually and avoid the steeper barren stretches, and immediately started up it at a scrambling trot, his eyes fixed resolutely ahead.

But after he had gone a little way, he saw something that made him stop and stare despite the compulsion driving him.

On a pine-framed boulder about a dozen yards ahead, to one side of the route he was taking, three cats sat watching him.

They were cats, all right, house cats, though they seemed to be of a particularly thick-furred breed.

But one wouldn't normally find house cats on a wild-life reserve. Their presence argued the nearness of human habitation. Moreover, they were eying him with a poised intentness that indicated some kind of familiarity, and did not fit with their earlier racing for cover—if those had been the same animals.

He called, "Kitty!" His voice cracked a little. "Kitty!"

The sound drifted thinly across the hillside, as if congealed by the cold.

And then the sound was answered, or rather echoed, by the cat to the right, a black and gray.

It was not exactly the word "Kitty" that the cat miauled, but it was a sound so like it, so faithful to his exact intonations, that his flesh crawled.

"Kii . . . eee." Again the eerily mocking, mimicking challange rang out.

He was afraid.

He started forward again. At the first scrape of his boots on gravel, the cats vanished.

For some time he made fast, steady progress, although the going was by no means easy, sometimes leading along the rims of landslides, sometimes forcing him to fight his way through thick clumps of scrub trees. The last "Kii . . . eee" stuck in his ears, and at times he was pretty sure he glimpsed furry bodies slipping along to one side, paralleling his progress. His thoughts went off on unpleasant tacks, chiefly about the degree to which careful breeding had increased the intelligence of house cats, the way in which they had always maintained their aloof and independent life in the midst of man's civilization, and other less concrete speculations.

Once he heard another sound, a repetition of the melancholy howling that had first startled him in the cave. It might have been wolves, or dogs, and seemed to come from somewhere low in the ravine and quite a distance away.

The sky was growing darker.

The rapid ascent was taking less out of him than he would have imagined. He was panting, but in a steady, easy way. He felt he could keep up this pace for a considerable distance.

The pines began to thin on the uphill side. He emerged onto a long, wide slope that stretched, ever-steepening, boulder-strewn but almost barren of vegetation, to the ravine's horizon. His easiest way lay along its base, past tangled underbrush.

A little distance ahead and up the slope, a large chunk of granite jutted out. On its rim sat three cats, again regarding him. Something about the way they were turned toward each other, the little movements they made, suggested that they were holding a conference and that the topic of the conference was—he.

From behind and below the howling came again. The cats pricked up their ears. There were more movements, more glances in his direction. Then as he began jogging along again, one of the cats—the tiger—leaped down and streaked away past him, downhill. While the black-and-gray and the black dropped off the granite rim more leisurely and began to trot along in the direction he was taking, with frequent sidewise glances.

He quickened his pace, grateful for the reserve energy.

The going was good. There were no eroded chutes to be edged around, no pines to fight.

Once the howling was repeated faintly.

The shadowy bodies of the cats slipped between the boulders, in and out. Gradually he began to draw ahead of them.

For some reason everything felt very natural, as if he had been created for this running through the dusk.

He sprinted up the last stretch, came out on top.

For a long time he just looked and turned, and turned and looked. Everything else—emotions, thought—was subordinated to the act of seeing.

Up here it was still pretty light. And thre were no hills to shut out the view. It stretched, snow-streaked, lightless, lifeless, achingly drear, to black horizons in three directions and a distant glittering ice-wall in the fourth.

The only suggestion of habitation was a thin pencil of smoke rising some distance across the plateau he faced.

For as long as he could, he pretended not to recognize the ruins sparsely dotting the landscape—vast mountainous stumps of structures, buckled and tortured things, blackened and ice-streaked, surrounded by strange formations of rock that suggested lava ridges, as if the very ground had melted and churned and boiled when those ruins were made.

A ruined world, from which the last rays of a setting sun, piercing for a moment the smoky ruins, struck dismal yellow highlights.

But recognition could only be held at bay for a few minutes. His guess about the ravine had been correct. That snow-shrouded, mile-long mound ahead of him was the grave of the Opal Cross. That dark monolith far to the left was the stump of the Gray H. Those two lopped towers, crazily buckled and leaning toward each other as if for support, were the Gray Twins. That split and jagged mass the other side of the ravine, black against the encroaching ice, upthrust like the hand of a buried man, was the Rusty T.

It could hardly be World I, no matter after what catastrophe or lapse of years. For there was no sign, not even a suggestive hump, of the Blue Lorraine, the Mauve Z, or the Myrtle Y. Nor World II, for the Black Star's ruins would have bulked monstrously on the immediate left.

He looked at his hands.

They were thickened and calloused, ridged and darkened by scars of wounds and frostbite, the nails grained and uneven. And yet they were Thorn's hands.

He lifted them and touched his chapped, scaly face, with its high-growing, uncombed beard and long hair matted against his neck under the fur hood.

His clothes were a miscellany of

stiff, inexpertly-tanned furs, portions of a worn and dirty suit of flying togs, and improvised bits of stuff, such as the hacked-out sections of elastoid flooring constituting the soles of his boots.

His heavy belt, which was reinforced with reading-tape, supported two pouches, besides the knife, which seemed to be a crudely-hilted cutter from a hyperlathe.

One of the pouches contained a sling-shot powered by strips of elastoid, several large pebbles, and three dark, dubious chunks of meat.

In the other were two small containers of nutriment-concentrate with packaging-insignia of twenty-five years ago, a stimulol cannister with one pellet left, two bits of sharp metal, a jagged fragment of flint, three more pieces of elastoid, more reading tape, a cord made of sinew, a glastic lens, a wood carver's handsaw, a small, dismantled heat-projector showing signs of much readaptive tinkering, several unidentifiable objects, and — the smooth gray sphere he had stolen at the Yggdrasil.

Even as he was telling himself it could not be the same one, his blunt fingers were recognizing its unforgettable smoothness, its oblate form, its queerly exaggerated inertia. His mind was remembering he had fancied it a single supergiant molecule, a key—if one knew how to use it—to the doors of unseen worlds.

But there was only time to guess that the thing must be linked to his mind rather than to any of the bodies his mind had occupied, and to wonder how it had escaped the thorough search to which he had been subjected in the Black Star, when his attention was diverted by a faint eager yapping that burst out suddenly and was as suddenly choked off.

He turned around. Up the boulder-studded slope he had just ascended, streaming out of the underbrush at its base, came a pack of wolves, or dogs—at least thirty of them. They took the same sloping course that he had taken. There was a strange suggestion of discipline about their silent running. He could not be sure—the light was very bad—but he fancied he saw smaller furry shapes clinging to the backs of one or two of them.

He knew now why he had spent time admiring a fire.

But the pack was between him and that fire, so he turned and ran across the plateau toward where he had glimpsed the rising whisp of smoke.

As he ran he broke out and chewed the lone stimulol pellet, breathing thanks to that Thorn—he would call him Thorn III—who had hoarded the pellet for so many years, against some ultimate emergency.

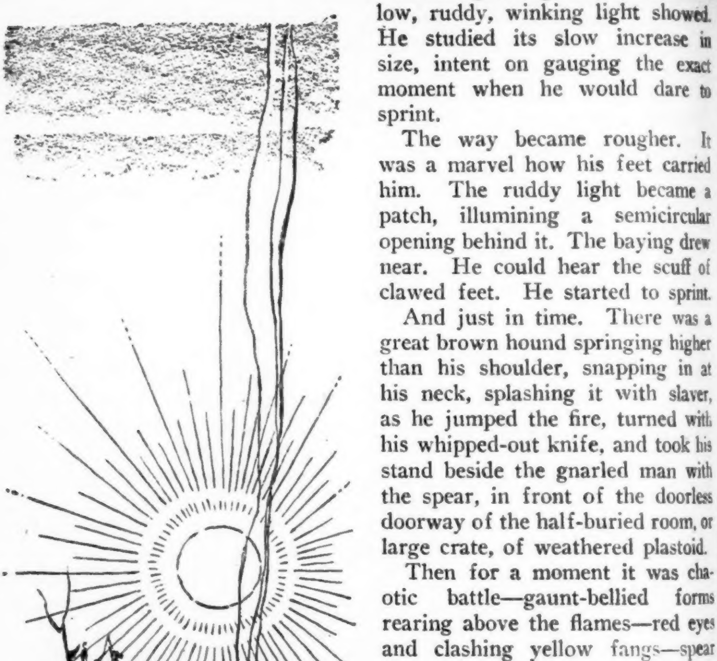
He ran well. His clumsily-booted feet avoided rocks and ruts, hit firmly on icy patches, with a sureness that made him wonder if they did not know the route. And when the stimulol hit his bloodstream, he was able to increase speed slightly. But risking a look back, he saw the pack pouring up over the crest. A steady baying began, eager and mournful.

In the growing darkness ahead a low, ruddy, winking light showed. He studied its slow increase in size, intent on gauging the exact moment when he would dare to sprint.

The way became rougher. It was a marvel how his feet carried him. The ruddy light became a patch, illumining a semicircular opening behind it. The baying drew near. He could hear the scuff of clawed feet. He started to sprint.

And just in time. There was a great brown hound springing higher than his shoulder, snapping in at his neck, splashing it with slaver, as he jumped the fire, turned with his whipped-out knife, and took his stand beside the gnarled man with the spear, in front of the doorless doorway of the half-buried room, or large crate, of weathered plastoid.

Then for a moment it was chaotic battle—gaunt-bellied forms rearing above the flames—red eyes and clashing yellow fangs—spear and cutter licking out—reek of singed hair—snarls, squeals, grunts, gasps—and, dominating it all, making it hellish, those three spitting, mewing cat-faces peering over the shoulders of three dogs that hung in the rear.



Then, as if at a note of command, the dogs all retreated and it was suddenly over. Without a word, Thorn and the other man began to repair and restock with fuel the scattered fire. When it was finished, the other man asked, "Did they get you anywhere? I may be crazy, but I think the devils are starting to poison the teeth of some of the hounds."

Thorn said, "I don't think so," and began to examine his hands and arms.

The other man nodded. "What food you got?" he asked suddenly.

Thorn told him. The other man seemed impressed by the nutriment-concentrate. He said, "We could hunt together for a while, I guess. Ought to work out good—having one watching while the other sleeps." He spoke rapidly, jumbling the words together. His voice sounded disused. He studied Thorn uneasily.

Thorn studied him. He was smaller and moved with a limp, but beard, skin, and clothing were like Thorn's. The screwed-up face was not familiar. The darting, red-rimmed eyes below the jutting brows were not altogether sane. Thorn's presence seemed to put him on edge, to shake his emotions to the core. Every time he snapped shut his cracked, nervous lips, Thorn felt that he dammed up a torrent of babblingly eager talk.

He asked Thorn, "Where did you come from?"

"A cave in the ravine," Thorn replied, wondering how much to tell. "What's your story?"

The man looked at him queerly. He trembled. Then the cracked lips opened.

To Thorn, squatting there behind the crackling fence of flame, staring out into a night that was black except for the occasional red hint of eyes, it seemed that what he heard was what he had always known.

"My name was Darkington. I was a geology student. What saved me was that I was in the mountains when the power broke loose. I guess we all knew about the power, didn't we? It was in the air. We'd always known that some day someone would find out what it was behind gravity and electricity and magnetism"—he stumbled over the long words—"and the more they tried to hush it up, the surer we were that someone had found out. I guess they shouldn't have tried to hush it up. I guess intelligent creatures can't back out of their destiny like that.

"But anyway I was in the mountains when the power broke loose and ate up all the metal it could reach. Our party was laid up by the fumes, and two of them died. Afterwards some of us started out to try to contact other survivors, but the fumes were worse where we went and some more died and the rest broke up. I got in with a gang that was trying to make a go of farming just north of the volcano belt, but we made a lot of mistakes and then came the first of the long winters and finished off all our plans and made us realize that the weather had all gone different, what with the exposed raw rock taking all the carbon dioxide out of the air, and not enough green stuff left to replace it. After that I drifted around and took up with different scavenging gangs, but when the cannibalism started and the cats and dogs began to get really dangerous, I headed north and made it to the glaciers. Since then I've just hung on, like you see me."

He turned to Thorn. Already his voice was hoarse. Like nervous hunger, his eagerness to talk had not carried him far.

Thorn shook his head, peering beyond the fire. "There must be a way," he said slowly. "Admittedly it would be difficult and we'd risk our lives, but still there must be a way."

"A way?" the other asked blankly.

"Yes, back to wherever men are beginning to band together and rebuild. South, I suppose. We might have to hunt for a long time, but we'd find it."

There was a long silence. A curious look of sympathy came into the other man's face.

"You've got the dreams," he told Thorn, making his croaking voice gentle. "I get them myself, so strong that I can make myself believe for a while that everything's the way it was. But it's just the dreams. Nobody's banding together. Nobody's going to rebuild civilization, unless"—his hand indicated something beyond the fire—"unless it's those devils out there."

XI.

He who lets fortunetellers shape his decisions, follows a chartless course.

Artemidorus of Cilicia

Alternate waves of guilt and almost unbearable excitement washed Clawly I as he hurried through the deserted corridors of the Blue Lorraine toward the office of Oktav. In grimmest seriousness he wondered whether his own fancied role of mad Pied Piper had not come true, whether his mind—and those of Firemoor and his other accomplices in the Martian hoax—were not already more than half usurped by diabolically mischievous mentalities whose only purpose, or pleasure, was to see a sane world reduced to chaos.

For the faked threat of a Martian invasion was producing all the effects he could ever have anticipated, and more, as the scenes he had just been witnessing proved. They stuck in his mind, those scenes. The air around the Blue Lorraine aswarm with fliers from bullet-swift couriers to meddlesome schoolchildren. Streams of machine-units and various materials and supplies going out on subtronic currents for distribution to selected points in the surrounding countryside, for it had early become apparent that the skylons were exceedingly vulnerable to attack from space—all Earth's eggs in a few thousand baskets. Engineers busy around the Blue Lorraine's frosty summit, setting up energy-projectors and other improvised subtronic artillery—for although the skylons were vulnerable, they were the proud symbols and beloved homes of civilization and would be defended to the last. All eyes craned apprehensively upward as a thundering spaceship burst through the blue sky, then lowered in ruefully humorous relief as it became obvious that it was, of course, no alien invader, but one of Earth's own ships headed for the nearby yards to be fitted with subtronic weapons. All eyes turned momentarily to the west, where defensive screens were being tried out, to watch a vast iridescent dome leap momentarily into being and a circle of woodland puff into smoke. Excited eyes, all of them, as ready to flash with humor as to betray shock, anxiety, or fear. Eyes that were seven-eighths "There probably won't be any invasion" and one-eighth "There will be." Eyes that made Clawly proud of mankind, but that also awakened sickening doubts as to the wisdom of his trickery.

And to think that this sort of thing was going on all over the world. The use of subtronic power in transport and fabrication made possible a swiftness in preparation never before known in Earth's history. Organization was a weak point, the Earth being geared for the leisurely existence of peace and individual freedom, but various local agencies were taking over while the World Executive Committee created the framework of a centralized military authority. Confusedly perhaps, and a little bunglingly, but eagerly, wholeheartedly, and above all swiftly, Earth was arming to meet the threat.

It was all so much *bigger* than anyone could have anticipated, Clawly told himself for the hundredth, time, unconsciously increasing his already rapid pace as he neared Oktav's office. He had started it all, but now it was out of his hands. He could only wait and hope that, when the real invasion came, across time rather than space, the present preparations would prove useful to Earth's bewildered defenders. In any case, a few hours would tell the story, for this was the third day.

But what if the transtime invasion did not come in three days? The hoax might be uncovered at any moment now—Firemoor was already regretting the whole business, on the verge of a funk—and during the period of angry reaction no invasion reports of any sort would be believed. Then he would be in the position of having cried wolf to the world.

Or what if the transtime invasion did not come at all? All his actions had been based on such insubstantial evidence — Thorn's dream-studies, certain suggestive psychological aberrations, the drugged Conjerly's murmur of ". . . invasion . . . three days . . ." He was becoming increasingly convinced that he would soon wake, as if from a nightmare, and find himself accused as a madman or charlatan.

Certainly his nerves were getting out of hand. He needed Thorn.

Never before had he realized the degree to which he and Thorn were each other's balance wheel. But Thorn was still missing, and the inquiry agencies had no progress to report. Despite the larger anxieties in which his mind was engulfed, Thorn's absence preyed upon it to such a degree that he had twice fancied he spotted Thorn among the swirling crowd outside the Blue Lorraine.

But even more than he needed Thorn, he needed Oktav. Now that the crisis had come, he could see to what an extent the seer's advice had determined all his actions, from his first serious belief in the possibility of transtime invasion to his engineering of the Martian hoax. Call it superstition, ignorant credulity, hynotism, the fact remained that he believed in Oktav, was convinced that Oktav had access to fields of knowledge undreamed of by ordinary men. And now that Oktav was gone, he felt an increasing helplessness and desperation, so that he could not resist the impulse driving him back once more to the cryptically empty office.

As he raised his hand to activate the door, memories came stealing eerily back—of former sessions in the room beyond, of the last session, of Oktav's strange summoner clad in the garments of Dawn Civilization, of the inexplicable disappearance of summoner and summoned in the exitless inner chamber.

But before his hand could activate the door, it opened.

Clad in his customary black robe, Oktav was sitting at his desk.

As if into a dream within a dream, Clawly entered.

Although the seer had always seemed supernaturally ancient, Clawly's first impression was that Oktav had vastly aged in the past three days. Something had happened to drain his small remaining store of life forces almost to the last drop. The hands were folded white claws. The face was wrinkle-puckered skin drawn tight over a fragile skull. But in the sunken, droopingly lidded eyes, knowledge burned more fiercely than ever. And not knowledge alone, but also something new—a reckless determination to use that knowledge. It was a look that made Clawly shiver—and thrill.

All the questions that had pounded at his brain so long, waiting for this interview, were suddenly mute.

"I have been on a far journey," said the seer. "I have visited many worlds that were supposed to be dead, and have seen what strange horrors can result when mere men seek to make wise use of a power befitting only a god or creatures like gods. I have gone in constant danger, for there are those against whom I have rebelled and who therefore seek my life, but I am safe from them for a time. Sit down, and I will tell you what is in my mind."

Clawly complied. Oktav leaned forward, tapping the desk with one bone-thin finger.

He continued, "For a long time I have spoken to you in riddles.

dealt with you vaguely, because I was trying to play a double game—impart essential information to you, and yet not impart it. That time is past. From now on I speak clearly. In a little while I shall depart on a desperate venture. If it succeeds, I do not think you will have to fear the invasion threatening your world. But it may fail, and therefore I must first put at your disposal all the information I possess, so that you can judge how best to act in that event."

He looked up quickly. Clawly heard movement in the corridor. But it was from the inner chamber that the sudden interruption came.

Once again Oktav's summoner stood in the inner doorway. Once again that young-old, ignorant-wise, animal-god face was turned on Oktav. The muscles of the clamped jaw stood out like knobs. One arm in its cylinderlike sleeve of stiff, ancient fabric, was rigidly extended toward the seer.

But Clawly had only time for the barest glance, and Oktav had even less—he was just starting to turn and his eyes were only on the verge of being lighted with a flicker of recognition—when a great tongue of softly bluish flame licked out from the summoner's hand and, not dying as flames should, folded around Oktav like a shroud.

Before Clawly's eyes, Oktav's robe burst into flame. His body shriveled, blackened, contorted in agony, curling like a leaf. Then it was still.

The soft flame returned to the summoner's hand.

Incapable of motion or connected thought or any feeling but a sick dismay, Clawly watched. The summoner walked over to Oktav's desk—clumsily, as if he were not used to dealing with three-dimensional worlds, but also contemptuously, as if worlds of three or any other number of dimensions were very trivial affairs to him. He extracted from the charred remains of Oktav's robe a small gray sphere, which Clawly now saw was similar to one which the summoner had been holding in his outstretched hand. Then, with an equal clumsiness and contempt, with a sweeping glance that saw Clawly and ignored him, the summoner walked back through the inner doorway.

Clawly's body felt like a sack of water. He could not take his eyes off the thing behind the desk. It looked more like a burnt mummy than a burnt man. By some chance the blue flame had spared the high forehead, giving the face a grotesquely splotched appearance.

The outer door was opened, but Clawly did not turn or otherwise move. He heard a hissing inhalation—presumably when the newcomer saw the hideous corpse—but the newcomer had to come round in front before Clawly saw and recognized—or rather, partly recognized—him. And even then Clawly felt no reaction of astonishment or relief, or any reaction he might have expected to feel. The incredible scene he had just witnessed lingered like an after-image, and other thoughts and feelings refused to come into focus. The dead body of Oktav dominated his vision and his mind, as if emanating a palpable aura that blurred everything else.

The newcomer noted the incompleteness of Clawly's recognition, for he said, "Yes, I'm Thorn, but, I think you know, not the Thorn who was your friend, although I am inhabiting his body." To Clawly the words seemed to come from a great distance; he had to fight an insidious lethargy to hear them at all. They continued, "That Thorn is taking my place in the world—and three days ago I rejoiced to think of the suffering he would undergo there. Fact is, I was your enemy—his and yours—but now I'm not so sure. I'm even beginning to think we may be able to help each other a great deal. But I'm responsible for more lives than just my own, so until I'm sure of you, I daren't take any chances. That's the reason for this."

And he indicated the small tubular object in his hand, which seemed to be the dismantled main propulsion unit of a suit of flying togs—a crude but effective short-range blaster.

Clawly began to take him in, though it was still hard for him to see anything but the thing behind the desk. Yes, it was Thorn's face, all right, but with a very uncharacteristic expression of stubborn and practical determination.

The newcomer continued, "I've been following you because Thorn's memoranda tapes showed that you and he were working together in what seemed to be an effort to warn this world of its danger. But lately things have been happening that make me doubt that—things I want explained. What's this Martian invasion? Is it real? Or an attempt to rouse your world into a state of preparedness? Or a piece of misdirection designed to confuse the issue and make the Servant's invasion easier? Then, why did you come here, and who is this creature, and how did he die?" With a gesture of repugnance, he indicated the body of Oktav. "What I overheard reawakened my old suspicion that there's somebody behind this business of duplicate worlds, somebody who's making a profit from it, somebody—"

His voice went dead. In an instant, all the frowning concentration blanked out of his face. Very slowly, like a man who suddenly becomes aware that there is a monster behind him, he began to turn around.

At the same time, Clawly felt himself begin to shake—and for the same reason.

It was a very small and ordinary thing—just a small cough, a dry clearing of the throat. But it came from behind the desk.

The shriveled, scorched body was swaying a little; the charred hands were pushing across the desk, leaving black smears; a tremor was apparent in the blackened jaw.

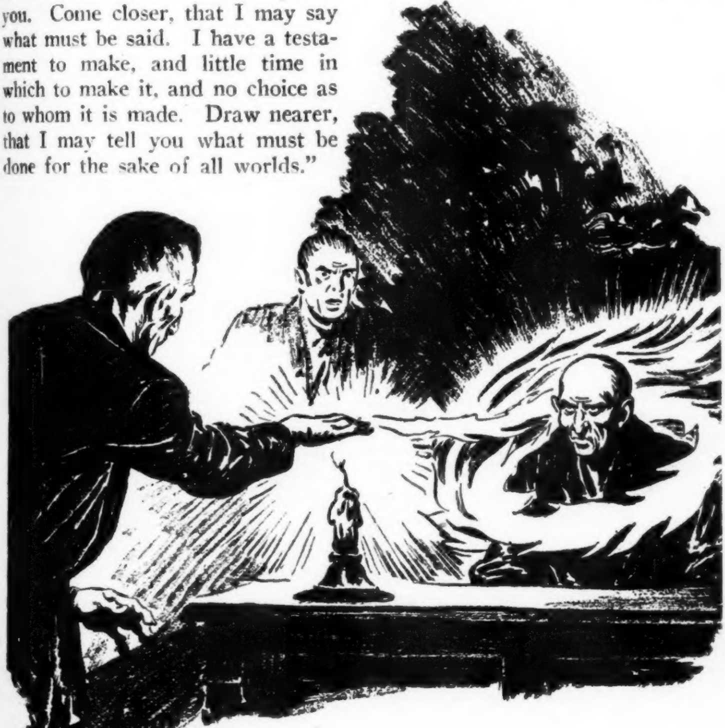
For a moment they only watched in horror. Then, drawn by the same irresistible impulse, they slowly approached the desk.

The blind, ghastly movements continued. Then the burnt lips parted, and they heard the whisper—a whisper that was in every syllable a hard-won victory over seared tissues.

"I should be dead, but strange vitalities linger in him who has possessed a talisman. My eyes are embers, but I can dimly see you. Come closer, that I may say what must be said. I have a testament to make, and little time in which to make it, and no choice as to whom it is made. Draw nearer, that I may tell you what must be done for the sake of all worlds."

They obeyed, sweat starting from their foreheads in awe of the inhumanly sustained vitality that permitted this charred mummy to speak.

"Purely by chance, a man of the Dawn Civilization discovered a talisman—a small nonmechanical engine controlled by thought—giving him the power of traveling in time, and across time, and into the regions beyond time. There it



led him to seven other talismans, and to a similar but larger engine of even greater power, which he named the Probability Engine. He took in with him seven accomplices, I being one, and together we used the Probability Engine to split time and make actual all possible worlds, preserving only the best of them, and—so we thought—destroying the rest."

The whisper slowly began to diminish in strength. Clawly and the other leaned in closer to the black, white-foreheaded face.

"But I discovered that those destroyed worlds still exist, and I know too well what mad tinkering the others will be prompted to, when they make the same discovery. You must prevent them, as I intended to. In particular, you must find the Probability Engine and summon its true owners, whatever creatures they may be, who built it and who lost the first talisman. They're the only ones fitted to deal with the tangle of problems we have created. But to find the Probability Engine, you must have a talisman. Ters, who destroyed me, took mine, but that was one which I had stolen. My own original talisman is in the position of Thorn, the Thorn of this world, who stole it from me, I now believe, because of some unconscious prompting from the True Owners, groping through many-layered reality in an effort to find their lost engine. That Thorn is worlds away from here, more worlds than you suspect. But you"—his fingers fumbled sideways, touching those of the other Thorn, who did not withdraw his hand—"can get into touch . . . with him . . . through your linked . . . subonscious minds." The whisper was barely audible. It was obvious that even the talisman-vitalized strength was drawing to an end. "That talisman . . . which he has . . . is inert. It takes a key-thought . . . to unlock its powers. You must transmit . . . the key-thought . . . to him. The key-thought . . . is . . . 'Three botched . . . worlds—' "

The whisper trailed off into a dry rattle, then silence. The jaw fell open. The head slumped forward. Clawly caught it, palm to white forehead, and let it gently down on to the desk, where the groping fingers had traced a black, crisscross pattern.

Over it, Clawly's eyes, and those of the other Thorn, met.

XII.

The coup d'etat may appear in a thousand different guises. The prudent ruler suspects even his own shadow.

de Etienne

The Sky Room of the Opal Cross was so altered it was hard to believe it had been a festivities center only three days ago. The World Map and Space Map still held their dominating positions, but the one was dotted with colored pictorial symbols indicating the location of spaceports and spaceyards, defense installations, armament fabrication and conversion centers, regular and emergency power stations, field headquarters, and like military information, while the Space Map, in which a system of perspective realistically conveyed three-dimensional depth, was similarly dotted in the Marsward sector to indicate the real or hypothetic location of spacecraft. This latter map emphasized with chilling clarity the fact that Earth had nothing at all in the way of an interplanetary battle fleet, only a scattering of unarmed or lightly armed exploratory craft that now, by stretching a point, could be counted as scouts. While fanning out from Mars in a great hemisphere, hypothetic but none the less impressive, loomed a vast armada.

The rest of the Sky Room was filled with terraced banks of televisor panels, transmission boards, plotting tables, and various calculating machines, all visible from the central control table around which they crowded. One whole sector was devoted to other military installations and specialized headquarters in the Opal Cross. Other sectors linked the control table with field headquarters, observation centers, spacecraft, and so on.

But now all the boards and tables, save the central one, were unoccupied. The calculating machines were untended and inoperative. And the massed rows of televisor panels were all blank gray—as pointless as a museum with empty cases.

A similar effect of bewildered deflation was apparent in most of the faces of the World Executive Committee around the control table. The exceptions included Chairman Shielding, who looked very angry, though it was a grave anger and well under control; Conjerly and Tempelmar, completely and utterly impassive; Clawly, also impassive, but with the suggestion that it would only take a hairtrigger touch to release swift speech or action; and Firemoor, who, sitting beside Clawly, was plainly ill at ease—pale, nervous, and sweating.

Shielding, on his feet, was explaining why the Sky Room had been cleared of its myriad operators and clerks. His voice was as cuttingly realistic as a spray of ice water.

". . . and then," he continued, "when astronomic photographs incontrovertibly proved that there were no alien craft of any sort near Mars—certainly none of the size reported and nothing remotely resembling a fleet, not even any faintly suspicious asteroids or cometary bodies—I hesitated no longer. On my own responsibility I sent out orders countermanding any and all defense preparations. That was half an hour ago."

One of the gray panels high in the Opal Cross sector came to life. As if through a window, a young man with a square face and crisply cropped blond hair peered out. The emptiness of the Sky Room seemed to startle him. He looked around for a moment, then switched to high amplification and called down to Shielding,

"Physical Research Headquarters

reporting. A slight variation in spatio-temporal constants has been noted in this immediate locality. The variation is of a highly technical nature, but the influence of unknown spy-beams or range-finding emanations is a possible, thought unlikely, explanation."

Shielding called sharply, "Didn't you receive the order countermanding all activities?"

"Yes, but I thought—"

"Sorry," called Shielding, "but the order applies to Research Headquarters as much as any others."

"I see," said the young man and, with a vague nod, blanked out.

There was no particular reaction to this dialogue, except that the studied composure of Conjerly and Tempelmar became, if anything, more marked—almost complacent.

Shielding turned back. "We now come to the question of who engineered this criminally irresponsible hoax, which," he added somberly, "has already cost the lives of more than a hundred individuals, victims of defense-preparation accidents." Firemoor winced and went a shade paler. "Unquestionably a number of persons must have been in on it, mainly members of the Extraterrestrial Service. It couldn't have been done otherwise. But we are more interested in the identity of the main instigators. I am sorry to say that there can be no question as to the identity of at least two of these. The confession of three of the accomplices make it—"

"Co-ordination Center 3 reporting." Another of the Opal Cross panels had flashed on and its perplexed occupant, like the other, was using high amplification to call his message down to Shielding. "Local Power Station 4 has just cut me off, in the midst of a message describing an inexplicable drain on their power supply. Also, the presence of an unknown vehicle has been reported from the main rotunda."

"We are not receiving reports," Shielding shouted back. "Please consult your immediate superior for instructions."

"Right," the other replied sharply, immediately switching off.

"There you see, gentlemen," Shielding commented bitterly, "just how difficult it is to halt a hoax of this sort. In spite of all our efforts, there undoubtedly will be more tragic accidents before minds get back to normal." He paused, turned. "Clawly and Firemoor, what do you have to say for yourselves in justification of your actions, beyond a confession of wanton mischievousness, or—I must mention this possibility too—an attempt to create confusion for the furtherance of some treasonable plot? Remember it is not a matter of accomplices' confessions alone, who might conceivably perpetrate a hoax and then attempt to shift the blame onto blindly gullible and negligent superiors. There is also the testimony of two members of our own committee, who can for the moment remain anonymous—"

"I see no reason for that," drawled Tempelmar.

"Thank you." Shielding nodded to him. "Very well, then. The testimony of Conjerly and Tempelmar." And he turned again toward the accused.

Firemoor looked down at the table and twisted miserably. Clawly returned Shielding's gaze squarely. But before either of them could reply—

"Co-ordination Center 4! Reporting the presence of a group of armed individuals in black garments of an unfamiliar pattern proceeding—"

"Please do not bother us!" Shielding shouted irritably. "Consult your superior! Tell him to refer all communications to Co-ordination Center I!"

This time the offending panel blanked out without reply.

Shielding turned to a master control board behind him and rapidly flipped off all the beams, insuring against future interruption.

Clawly stood up. His face had the frozenness of pent tension, an odd mixture of grim seriousness and mocking exasperation at men's blindness, suggestive of a gargoyle.

"It was a hoax," he said coolly, "and I alone planned it. But it was a hoax that was absolutely necessary to prepare the world for that other invasion, against which I tried to warn you three days ago. The invasion whose vanguard is already in our midst. Of course Conjerly and Tempelmar testified against me—for they are part of the vanguard!"

"You're psychotic," said Shielding flatly, lowering his head a little, like a bull. "Paranoid. The only wonder is how it escaped the psychiatrists. Watch him, some of you"—he indicated those nearest Clawly—"while I call the attendants."

"Stay where you are, all of you! And you, Shielding, don't flip that beam!" Clawly had danced back a step, and a metal tube gleamed in his hand. "Since you believe I planned the Martian hoax—and I did—perhaps you'll believe that I won't stop at a few more deaths, not accidental this time, in order to make you see the truth. Idiots! Can't you see what's happening under your very noses? Don't you see what those reports may have meant? Call Co-ordination Center I, Shielding. Go on, I mean it, call them!"

But at that instant Firemoor spun round in his chair and dove at Clawly, pinioning his arms, hurling them both down, wrenching the metal tube from his hand, sending it spinning to one side. A moment later he had dragged Clawly to his feet, still holding him pinioned.

"I'm sorry," he gasped miserably. "But I had to do it for your own sake. We were wrong—wrong to the point of being crazy. And now we've got to admit it. Looking back, I can't see how I ever—"

But Clawly did not even look at him. He stared grimly at Shielding.

"Thank you, Firemoor," said Shielding, a certain relief apparent in his voice. "You still have a great deal to answer for. That can't be minimized—but this last action of yours will certainly count in your favor."

This information did not seem to make Firemoor particularly happy. The pinioned Clawly continued to ignore him and to stare at Shielding.

"Call Communications Center I," he said, deliberately.

Shielding dismissed the interruption with a glance. He sat down.

"The attendants will remove him shortly. Well, gentlemen," he said, "it's time we considered how best to repair the general dislocations caused by this panic. Also there's the matter of our position with regard to the trial of the accomplices." There was a general pulling-in of chairs.

"Call Communications Center I," Clawly repeated.

Shielding did not even look up.

But someone else said, "Yes. I think now you'd better call them."

Shielding had started automatically to comply, before he realized just who it was that was speaking—and the particular tone that was being used.

It was Conjerly and the tone was one of command.

Conjerly and Tempelmar had risen, and were standing there as solidly as two obelisks—and indeed there was something unpleasantly monumental in their intensified, self-satisfied composure. Before anyone realized it, the center of attention of the meeting had shifted from Clawly and Firemoor to these new figures—or rather to these old and familiar figures suddenly seen in a new and formidable guise.

Shielding blinked at them a moment, as if he didn't know who they were. Then, with a haste that was almost that of fear, he swung around and flipped a beam on the board behind him.

Halfway up the terraced banks of gray squares, a panel came to life.

A man in black uniform looked down from it.

"Communications Center I seized for the Servants," he announced crisply in a queerly accented though perfectly intelligible voice.

Shielding stood stock-still for a moment, then flipped another beam.

"The soldiers of the Servants are in control at this point," said the second black-uniformed individual, speaking with equal crispness.

With a stifled, incredulous gasp, Shielding ran his hand down the board, flipping on all the panels in the Opal Cross sector.

Most of them showed black-uniformed figures. Of the remainder, the majority were empty.

And then it became apparent that not all the black-uniformed figures were merely televised images. Some of them were standing between the panels, in the Sky Room itself, holding weapons trained.

By a psychological illusion, the figures of Conjerly and Tempelmar seemed to grow taller.

"Yes," Conjerly said, soberly, almost kindly, "your government—or, rather, that absence of all sane control which you call a government —is now in the capable hands of the Servants of the People. Clawly's assertions were all quite correct, though fortunately we were able to keep you from believing them —a necessary deception. There *is* an invasion going on—an invasion that is in the best interests of all worlds, and one from which yours will benefit greatly. It is being made across time, through a region that has become common to both our worlds. That region is our transtime bridgehead. And, as is plain to see, our bridgehead coincides with your headquarters."

Clawly was not listening. He was watching a figure that was striding down the paneled terraces, its smilingly curious eyes fixed upon him. And as he watched, Firemoor and Shielding and some others began to watch too, slack-faced, dully amazed at this secondary impossibility.

The approaching figure was clad in black military flying togs whose sleek cut and suavely gleaming texture marked them as those of an individual of rank. But so far as physique and appearance were concerned, down to the last detail of facial structure, including even a similarity of expression—a certain latent sardonic mockery—he was Clawly's duplicate.

There was something very distinctive about the way the two eyed each other. No one could have said just when it started, but by the time they were facing each other across the control table, it was very plain; the look of two men come to fight a duel.

Clawly's face hardened. His gaze seemed to concentrate. His duplicate started, as if at a slight unexpected blow. For an instant he grinned unpleasantly, then his face grew likewise grim.

Neither moved. There was only that intense staring, accompanied by a silent straining of muscles and a breathing that grew heavy. But none of those who watched doubted but that an intangible duel was being fought.

Conjerly, frowning, stepped forward. But just then there grew a look of sudden desperate terror in the contorted face of Clawly's black-clad duplicate. He staggered back a step, as if to avoid falling into a pit. An unintelligible cry was wrenched out of him, and he snatched at his holster.

But even as he raised the weapon, there flashed across the first Clawly's features a triumphant, oddly *departing* smile.

XIII.

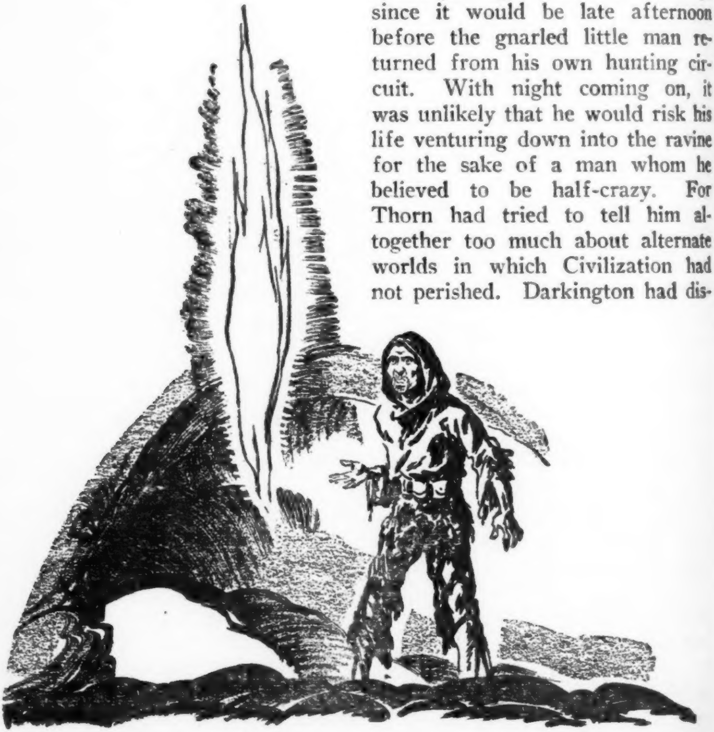
Yggdrasil shakes, and shiver on high
The ancient limbs, and the giant is loose;
Elder Edda

In the black, cramping tunnel Thorn could only swing his knife in a narrow arc, and the snarl of the attacking dog was concentrated into a grating roar that hurt his eardrums. Nevertheless, knife took effect before fangs, and with an angry whimper the dog backed away—there was no room to turn.

From the receding scuffle of its claws Thorn could tell that it had retreated almost to the beginning of the tunnel. He relaxed from the crouch that had put his back against the rocky roof, sprawled in a position calculated to rest elbows and knees, and considered his situation.

Of course, as he could see now, it had been an inexcusable blunder to enter the tunnel without first building a fire to insure his being able to get back to a place from which he could use his slingshot. But coming down the ravine he hadn't seen a sign of the devils, and there was no denying it had been necessary to revisit the cave to see if Thorn III had any extra food, weapons, or clothing stored there. The need for food was imperative, and yesterday he and Darkington had completely failed in their hunting.

He wondered if Darkington would attempt a rescue. Hardly, since it would be late afternoon before the gnarled little man returned from his own hunting circuit. With night coming on, it was unlikely that he would risk his life venturing down into the ravine for the sake of a man whom he believed to be half-crazy. For Thorn had tried to tell him altogether too much about alternate worlds in which Civilization had not perished. Darkington had dis-



missed all this as "the dreams," and Thorn had shut up, but not until he realized he was forfeiting all Darkington's confidence in him as a hard-bitten and realistic neo-savage.

Besides, Darkington was a little crazy himself. Long years of solitary living had developed fixed habit patterns. His hunger for comradeship had become largely a subjective fantasy, and the unexpected appearance of an actual comrade seemed to make him uncomfortable and uneasy rather than anything else, since it demanded readaptation. A man marooned in a wilderness and trying to get back to civilization is one thing. But a man who knows that civilization is dead and that before him stretch only dark savage eons in which other creatures will have the center of the stage, is quite a different animal.

Something was digging into Thorn's side. Twisting his left hand back at an uncomfortable angle—his right still held the knife or cutter—he worked the pouch from under him and took out the offending article. It was the puzzling sphere that had stayed with him during all his passages between the worlds. Irritably he tossed it away. He had wasted enough time trying to figure out the significance or purpose of the thing. It was as useless as . . . as that graveyard of skylons up there.

He heard it bound up the tunnel, roll back a way, come to rest.

Evidently his captors heard it too, for there came a sharp mewing and growling, which did not break off sharply, but sank into a confused palaver of similar sounds, strongly suggestive of some kind of speech. Once or twice he thought he recognized human words, oddly telescoped and slurred to fit feline and canine palates. It was not pleasant to be cramped up in a tunnel and wondering what cats and dogs were saying about you in a half-borrowed, quasi-intelligent jargon.

And then, very softly, Thorn thought he heard someone calling his name.

His almost immediate reaction was a sardonic grimace at the vast number of unlikely sounds a miserable man will twist into a resemblance of his name. But gradually the fancied sound began to exert a subtle pull on his thoughts, dragging them away toward speculations which his present predicament did not justify.

But who is to say what thoughts a trapped and doomed man shall think? As Thorn told himself with some calmness, this was probably his last stretch of reflective thinking. Of course, when death came sufficiently close, the fear of it might enable him to escape into another body. But that was by no means certain or even probable. He reflected that every exchange he had made had been into a worse world. And now, presumably, he was at the bottom, and like energy that has reached the nadir of its cycle of degradation, unable to rise except with outside help.

Besides, he did not like the idea of dooming any other Thorn to this predicament, although he was afraid he would do it if given the chance.

Again he dreamily fancied he heard his name called.

He wondered what was happening to those other Thorns, in their hodgepodged destinies. Thorn III in World II—had he died in the instant of his arrival there, or had the Servants noted the personality-change in time and perhaps spared him? Thorn II in World I. Thorn I in World III. It was like some crazy game—some game devised by a mad, cruel god.

And yet what was the whole universe, so far as it had been revealed to him, but a mad, cruel pageantry? The Dawn myth was right—there were serpents gnawing at every root of the cosmic ash Yggdrasil. In three days he had seen three worlds, and none of them were good. World III, wrecked by subtronic power, cold battlefield for a hopeless last stand. World II, warped by paternalistic tyranny, smoldering with hate and boredom. World I, a utopia in appearance, but lacking real stamina or inward worth, not better than the others—only luckier.

Three botched worlds.

He started. It was as if, with that last thought, something altogether outside his mind had attached itself to his mind in the most intimate way imaginable. He had the queerest feeling that his thoughts had gained power, that they were no longer locked-in and helpless except for their ability to control a puny lever-assembly of bones and contractile tissue, that they could reach out of his mind like tentacles and move things, that they had direct control of a vastly more competent engine.

A faint sound up the tunnel recalled his altered mind to his present predicament. It might have been a tiny scrape of claws on rock. It was not repeated. He gripped his knife. Perhaps one of the beasts was attempting a surprise attack. If only there were some light—

A yellowish flame, the color of the woodfire he had been visualizing, flared up without warning a few feet ahead, casting shafts of ruddy glare and shadow along the irregular tunnel. It lit up the muzzles of a gaunt gray dog and a scarred black cat that had been creeping toward him, side by side. For an instant surprise froze them. Then the dog backed off frantically, with a yelp of panic. The cat snarled menacingly and stared wildly at the flame, as if desperately trying to figure out its *modus operandi.*

But, with Thorn's thought, the flame advanced and the cat gave ground before it. At first it only backed, continuing to snarl and stare. Then it turned tail, and answering in a great screech the questioning mews and growls that had been coming down the tunnel, fled as if from death.

The flame continued to advance,

changing color when Thorn thought of daylight. And as Thorn edged and squirmed along, it seemed to him that somehow his way was made easier.

The tunnel heightened, widened. He emerged in the outer chamber in time to hear a receding rattle of gravel.

The flame, white now, had come to rest in the middle of the rocky floor. Even as he stooped, it rose to meet him, winking out—and there rested lightly on his palm the gray sphere, cool and unsmirched, that he had tossed away a few minutes before.

But it was no longer a detached, external object. It was part of him, responsive to his every mood and thought, linked to his mind by tracts that were invisible but as real as the nerves connecting mind with muscle and sense organ. It was not a machine, telepathically controlled. It was a second body.

Relief, stark wonder, and exulting awareness of power made him weak. For a moment everything swam and darkened, but only for a moment—he seemed to suck limitless vitality from the thing.

He felt a surge of creativeness, so intense as to be painful, like a flame in the brain. He could do anything he wanted to, go anywhere he wanted to, make anything he wanted to, create life, change the world, destroy it if he so willed—

And then—fear. Fear that, since the thing obeyed his thoughts, it would also obey his foolish, ignorant, or destructive ones. People can't control their thoughts for very long. Even sane individuals often think of murder, of catastrophes, of suicide—

Suddenly the sphere had become a gray globe of menace.

And then—after all, he couldn't do *anything*. Besides any other limitations the thing might have, it was certainly limited by his thoughts. It couldn't do things he didn't really understand — like building a subtronic engine—

Or—

For the first time since he had emerged from the tunnel, he tried to think collectedly, with more than the surface of his mind.

He found that the depths of his mind were strangely altered. His subconscious was no longer an opaque and impenetrable screen. He could see through it, as through a shadowy corridor, sink into it, hear the thoughts on the other side, the thoughts of the other Thorns.

One of them, he realized, was instructing him, laying a duty upon him.

The message dealt with such matters as to make the imagination shiver. It seemed to engulf his personality, his consciousness.

His last glimpse of World III was a gray one of dark, snow-streaked pines wavering in a rocky frame. Then that had clouded over, vanished, and he was in a limitless blackness where none of the senses worked and where only thought—itself become a sense—had power.

It was an utterly alien darkness without real up or down, or this way or that, or any normal spatial properties. It seemed that every point was adjacent to every other point, and so infinity was everywhere, and all paths led everywhere, and only thought could impose order or differentiate. And the darkness was not that of lightlessness, but of thought itself—fluttering with ghostly visions, aflash with insight.

And then, without surprise or any consciousness of alteration, he realized that he was no longer one Thorn, but three. A Thorn who had lived three lives—and whether memory pictured them as having been lived simultaneously or in sequence seemed to matter not at all. A Thorn who had learned patience and endurance and self-sufficiency from harsh World III, who had had ground into the bedrock of his mind the knowledge that man is an animal in competition with other animals, that all human aspirations are but small and vaunting and doomed things—but not necessarily worthless therefore—in a blind and unfeeling cosmos, and that even death and the extinguishing of all racial hopes are ills that can be smiled at while you struggle against them. A Thorn who had seen and experienced in World II the worst of man's cruelty to man, who had gained a terrible familiarity with human nature's weaknesses, its cowardly submissiveness to social pressure, its capacity for self-delusion, its selfishness, its horrible adaptability, who had plumbed to their seething, poisoning depths the emotions of hate and resentment and envy and fear, but who in part had risen superior to all this and learned humility, and sympathy, and sacrifice, and devotion to a cause. A Thorn who, in too-easy World I, had learned how to use the dangerous gift of freedom, how to fight human nature's tendency to go evil and foul itself when it is not being disciplined by hardship and adversity, how to endure happiness and success without souring, how to create goals and purposes in an environment that does not supply them ready-made.

All these experiences were now those of one mind. They did not contradict or clash with each other. Between them there was no friction or envy or guilt. Each contributed a fund of understanding, carrying equal weight in the making of future decisions. And yet there was no sense of three minds bargaining together or talking together or even thinking together. There was only one Thorn, who, except for that period of childhood before the split took place, had lived three lives.

This composite Thorn, sustained by the talisman, poised in the dimensionless dark beyond space and time, felt that his personality had suddenly been immeasurably enriched and deepened, that heretofore he had been going around two-thirds blind and only now begun to appreciate the many-sidedness of life and the real significance of all that he had experienced.

And without hesitation or inward argument, without any sense of responding to the urgings of Thorn II, since there was no longer a separate Thorn II, he remembered what the death-resisting Oktav had whispered to him in the Blue Lorraine, syllable by agonized syllable, and he recalled the duty laid upon him by the seer.

He thought of the first step—the finding of the Probability Engine—and felt the answering surge of the talisman, and submitted to its guidance.

There was a dizzying sense of almost instantaneous passage over an infinite distance—and also a sense that there had been no movement at all, but only a becoming aware of something right at hand. And then—

The darkness pulsed and throbbed with power, a power that it seemed must rack to pieces many-branched time and shake down the worlds like rotten fruit. The thought-choked void quivered with a terrifying creativity, as if this were the growing-point of all reality.

Thorn became aware of seven minds crowded around the source of the pulsations and throbbing and quivering. Homely human minds like his own, but lacking even his own mind's tripled insight, narrower and more paternalistic than even the minds of World II's Servants of the People. Minds festooned with error, barnacled with bias, swollen with delusions of godhead. Minds altogether horrible in their power, and in their ignorance—which their power protected.

Then he became aware of vast pictures flaring up in the void in swift succession—visions shared by the seven minds and absorbing them to such a degree that they were unconscious of his presence.

Like river-borne wreckage after an eon-long jam has broken, the torrent of visions flowed past.

World II loomed up. First the drab Servants Hall, where eleven old men nodded in dour satisfaction as they assured themselves, by report and transtime televisor, that the invasion was proceeding on schedule. Then the picture broadened, to show great streams of subtronically mechanized soldiers and weapons moving in toward the transtime bridgehead of the Opal Cross. Individual faces flashed by—wry-lipped, uninterested, obedient, afraid.

For a moment World I was glimpsed—the interior of the Opal Cross shown in section like an ant-hill, aswarm with black uniforms. Quickly, as if the seven masters hated to look at their pet world so misused, this gave way to a panoramic vision of World III, in which hundreds of miles were swept over without showing anything but fallen or fire-tortured skylons, seared and scrub-grown wasteland, and—cheek by jowl—glacier walls and smoke-belching volcanoes.

But that was only the beginning. Fruits of earlier time-splits were shown. There was a world in which telepathic mutants fought with jealous nontelepaths, who had found a way of screening their thoughts. There was a world in which a scarlet-robed hierarchy administered a science-powered religion that held millions in Dawn Age servitude. A world in which a tiny clique of hypnotic telepaths broadcast thoughts which all men believed in and lived by, doubtfully, as if in a half-dream. A world where civilization, still atomic-powered, was split into tiny feudalistic domains, forever at war, and the memory of law and brotherhood and research kept alive only in a few poor and unarmored monasteries. A world similarly powered and even more divided, in which each family or friends-group was an economically self-sustaining microcosm, and civilization consisted only of the social intercourse and knowledge-exchange of these microcosms. A world where men lived in idle parasitism on the labor of submen they had artificially created—and another world in which the relationship was reversed and the submen lived on men.

A world where two great nations, absorbing all the rest, carried on an endless bitter war, unable to defeat or be defeated, forever spurred to new efforts by the fear that past sacrifices might have been in vain. A world that was absorbed in the conquest of space, and where the discontented turned their eyes upward toward the new frontier. A world in which a great new religion gripped men's thoughts, and strange ceremonies were performed on hilltops and in spacecraft and converts laughed at hate and misery and fear, and unbelievers wonderingly shook their heads. A world in which there were no cities and little obvious machinery, and simply clad men led unostentatious lives. A sparsely populated world of small cities, whose inhabitants had the grave smiling look of those who make a new start. A world that was only a second asteroid belt—a scattering of exploded rocky fragments ringing the sun.

"We've seen enough!"

Thorn sensed the trapped horror and the torturing sense of unadmitted guilt in Prim's thought.

The visions flickered out, giving way to the blackness of unactualized thought. On this blackness Prim's next thought showed fiercely, grimly, monstrously. It was obvious that the interval had restored his power-bolstered egotism.

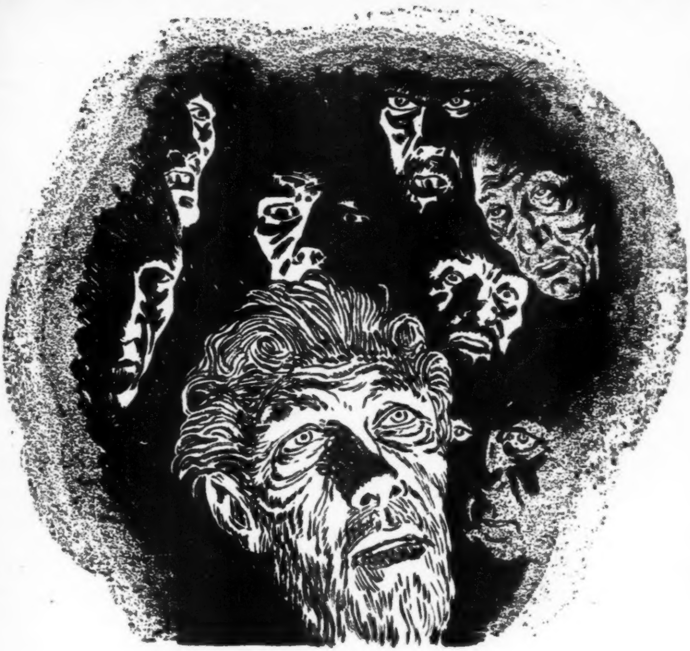
"Our mistake is evident but capable of correction. Our thoughts—or the thoughts of *some* of us—did not make it sufficiently clear to the Probability Engine that absolute destruction rather than a mere veiling or blacking out, was intended, with regard to the botched worlds. There is no question as to our next step. Sekond?"

"Destroy! All of them, except the main trunk," instantly pulsed the answering thought.

"Ters?"

"Destroy!"

"Kart?"



"The invading world first. But all the others too. Swiftly!"

"Kant?"

"It might be well first to . . . No! Destroy!"

With a fresh surge of horror and revulsion, Thorn realized that these minds were absolutely incapable of the slightest approach to unbiased reasoning. They were so fanatically convinced of the correctness of all their past decisions as to the undesirability of the alternate worlds, that they were even completely blind to the apparent success of some of those worlds—or to the fact that the destruction of a lifeless asteroid belt was a meaningless gesture. They could only see the other worlds as horrible deviations from the cherished main trunk. Their reactions were as unweighed and hysterical as those of a murderer, who taking a last look around after an hour spent in obliterating possible clues, sees his victim feebly stir.

Thorn gathered his will power for what he knew he must do.

"Sikst?"

"Yes, destroy!"

"Septem?"

"Destroy!"

"Okt—"

V35/2 APR 45 XU

But even as Prime remembered that there no longer was an Oktav and joined with the others in thinking destruction, even as the darkness began to rack and heave with a new violence, Thorn sent out the call.

"Whoever you may be, wherever you may be, Oh you who created it, here is the Divider of Time, here is the Probability Engine!"

His thought deafened him, like a great shout. He had not realized the degree to which the others had been thinking in the equivalent of muted whispers.

Instantly Prim and the rest were around him, choking his thoughts, strangling his mind, thinking his destruction along with that of the worlds.

The throbbing of the darkness became that of a great storm, in which even the Probability Engine seemed on the verge of breaking from its moorings. Like a many-branched lightning-flash, came a vision of time-streams lashed and shaken—Worlds I and II torn apart—the invasion bridge snapped—

But through it Thorn kept sending the call. And he seemed to feel the eight talismans and the central engine take it up and echo it.

His mind began to suffocate. His consciousness to darken.

All reality seemed to tremble on the edge between being and not-being.

Then without warning, the storm was over and there was only a great quiet and a great silence present, that might have come from the end of eternity and might have been here always.

Awe froze their thoughts. They were like boys scuffling in a cathedral who look up and see the priest.

What they faced gave no sign of its identity. But they knew.

Then it began to think. Great broad thoughts of which they could only comprehend an edge or corner. But what they did comprehend was simple and clear.

XIV.

And many a Knot unraveled by the
Road
But not the Master-knot of Human
Fate.
The Rubaiyat

Our quest for our Probability Engine and its talismans has occupied many major units even of our own time. We have prosecuted it with diligence, because we were aware of the dangers that might arise if the engine were misused. We built several similar engines to aid us in the search, but it turned out that the catastrophe in our cosmos which swept away the engine and cast one of the talismans up on your time-stream and planet, was of an unknown sort, making the route of the talisman an untraceably random one. We would have attempted a canvass of reality, except that a canvass of an infinitude of infinitudes is impossible. Now our quest is at an end.

I will not attempt to picture ourselves to you, except to state that we are one of the dominant mentalities in a civilized cosmos of a different curvature and energy-content than your own.

Regarding the Probability Engine—it was never intended to be used in the way in which you have used it. It is in essence a calculating machine, designed to forecast the results of any given act, weighing all factors. It is set outside space-time, in order that it may consider all the factors in space-time without itself becoming one of them. When we are faced with a multiple-choice problem, we feed each choice into the engine successively, note the results, and act accordingly. We use it to save mental labor on simple decision-making routines, and also for the most profound purposes, such as the determination of possible ultimate fates of our cosmos.

All this, understand, only involves forecasting — never the actualization of those forecasts.

But no machine is foolproof. Just because the Probability Engine was not made to create, does not mean that it cannot create, given sufficient mental tinkering. How shall I make it clear to you? I see from your minds that most of you are familiar with a type of wheeled vehicle, propelled by the internal combustion of gases, similar to vehicles used by some of the lower orders in our own cosmos. *You* would see in it only a means of transportation. But suppose one of your savages—someone possessing less knowledge than even yourselves—should come upon it. *He* might see it as a weapon—a ram, a source of lethal fumes, or an explosive mine. No safety devices you might install could ever absolutely prevent it from being used in that fashion.

You, discovering the Probability Engine, were in the same position as that hypothetic savage. Unfortunately, the engine was swept away from our cosmos with all its controls open—ready for tinkering. You poked and pried, used it, as I can see, in many ways, some close to the true one, some outlandishly improbable. Finally you worked off the guards that inhibit the engine's inherent creativity. You began to actualize alternate worlds.

In doing this, you completely reversed the function of the Probability Engine. We built it in order to avoid making unfavorable decisions. You used it to insure that unfavorable decisions would be made. You actualized worlds which for the most part would never have had a remote chance of existing, if you had left the decision up to the people inhabiting your world. Normally, even individuals of your caliber will show considerable shrewdness in weighing the consequences of their actions and in avoiding any choice that seems apt to result in unpleasant consequences. You, however, forced the unwise choices to be made as well as the wise ones—and you continued to do this after your own race had acquired more real wisdom than you yourselves possessed.

For the Probability Engine in no way increased your mental stature. Indeed, it had just the opposite effect, for it gave you powers which enabled you to escape the consequences of your bad judgments—and it truckled to your delusions by only showing you what you wanted to see. Understand, it is just a machine. A perfect servant—not an educator. And perfect servants are the worst educators. True, you could have used it to educate yourselves. But you preferred to play at being gods, under the guise of performing scientific experiments on a world that you didn't faintly understand. Godlike, you presumed to judge and bless and damn. Finally, in trying to make good on your damnations, you came perilously close to destroying much more than you intended to—there might even have been unpleasant repercussions in our own cosmos.

And now, small things, what shall we do with you and your worlds? Obviously we cannot permit you to retain the Probability Engine or any of the powers that go with it or the talismans. Also, we cannot for a moment consider destroying any of the alternate worlds, with a view to simplification. That which has been given life must be allowed to use life, and that which has been faced with problems must be given an opportunity of solving them. If the time-splits were of more recent origin, we might consider healing them; but deviation has proceeded so far that that is out of the question.

We might stay here and supervise your worlds, delivering judgments, preventing destructive conflicts, and gradually lifting you to a higher mental and spiritual level. But we do not relish playing god. All our experiences in that direction have been unpleasant, making us conclude that, just as with an individual, no species can achieve a full and satisfactory maturity except by its own efforts.

Again, we might remain here and perform various experiments, using the set-ups which you have created. But that would be abhorrent.

So, small things, there being no better alternative, we will take away our engine, leaving the situation you have created to develop as it will—with transtime invasions and interworld wars no longer an immediate prospect, though looming as a strong future possibility. With such sufferings and miseries and misunderstandings as exist, but with the future wide open and no unnatural constraints put on individuals sufficiently clear-headed and strong-willed to seek to avoid unpleasant consequences. And with the promise of rich and unusual developments lying ahead, since, so far as we know, your many-branched time-stream is unique among the cosmoses. We will watch your future with interest, hoping some day to welcome you into the commonwealth of mature beings.

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fault for allowing the Probability Engine to fall into your hands—and indeed, we shall make even stronger efforts to safeguard it from accident or tinkering in the future. But remember this. Young and primitive as you are, you are not children, but responsible and awakened beings, holding in your hands the key to your future, and with only yourselves to blame if you wantonly go astray.

As for you individuals who are responsible for all this botchwork, I sympathize with your ignorance and am willing to admit that your intentions were in part good. But you chose to play at being gods, and even ignorant and well-intentioned gods must suffer the consequences of their creations. And that shall be your fate.

With regard to you, Thorn, your case is of course very different. You responded to our blindly broadcast influencings, stole a talisman, and finally summoned us in time to prevent catastrophe. We are grateful. But there is no reward we can give you. To remove you from your environment to ours would be a meaningless gesture, and one which you would regret in the end. We cannot permit you to retain any talismanic powers, for in the long run you would be no better able to use them wisely than these others. We would like to continue your satisfying state of triplicated personality—it presents many interesting features—but even that may not be, since you have three destinies to fulfill in three worlds. However, a certain compromise solution, retaining some of the best features of the triplication, is possible.

And so, small things, we leave you.

From hastily chosen places of concealment and half-scooped foxholes around the Opal Cross, a little improvised army stood up. A few scattered fliers swooped down and silently joined them. The only uniforms were those of a few members of the Extraterrestrial Service. Among the civilians were perhaps a score of Recalcitrant Infiltrants from World II, won over to last-minute co-operation by Thorn II.

The air still reeked acridly. White smoke and fumes came from a dozen areas where earth and vegetation had been blasted by subtronic weapons. And there were those who did not stand up, whose bodies lay charred or had vanished in disintegration.

The ground between them and the Opal Cross was still freshly scored by the tracks of great vehicles. There were still wide swathes of crushed vegetation. At one point a group of low buildings had been mashed flat. And it seemed that the air above still shook with the aftermath of the passage of mighty warcraft.

But of the great mechanized army that had been fanning out toward and above them, not one black-uniformed soldier remained.

They continued to stare.

In the Sky Room of the Opal Cross, the members of the World

Executive Committee looked around at a similar emptiness. Only the tatters of Clawly's body remained as concrete evidence of what had happened. It was blown almost in two, but the face was untouched. This no longer showed the triumphant smile which had been apparent a moment before death. Instead, there was a look of horrified surprise.

Clawly's duplicate had vanished with the other black-uniformed figures.

The first to recover a little from the frozenness of shock was Shielding. He turned toward Conjerly and Tempelmar.

But the expression on the faces of those two was no longer that of conquerors, even thwarted and trapped conquerors. Instead there was a dawning, dazed amazement, and a long-missed familiarity that told Shielding that the masquerading minds were gone and the old Conjerly and Tempelmar returned.

Firemoor began to laugh hysterically.

Shielding sat down.

At the World II end of the broken transtime bridgehead, where moments before the Opal Cross had risen, now yawned a vast smoking pit, half-filled with an indescribable wreckage of war machines and men, into which others were still falling from the vanished skylon —like some vision of Hell. To one side, huge even in comparison with that pit, loomed the fantastically twisted metal of the transtime machine. Ear-splitting sounds still

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echoed. Hurricane gusts still blew.

Above it all, like an escaping black hawk above an erupting volcano, Clawly flew. Not even the titanic confusion around him, nor the shock of the time-streams' split, nor his horror at his own predicament, could restrain his ironic mirth at the thought of how that other Clawly, in trying to kill him, had insured the change of minds and his own death.

Now he was forever marooned on World II, in Clawly II's body. But the memory chambers of Clawly II's brain were open to him, since Clawly II's mind no longer existed to keep them closed, and so at one bound he had become a half-inhabitant of World II. He knew where he stood. He knew what he must do. He had no time for regrets.

A few minutes' flying brought him to the Opal Cross and it was not long before he was admitted to the Servants Hall. There eleven shaken old men looked up vengefully at him from reports of disaster. Their chairman's puckered lips writhed as he accused: "Clawly, I have warned you before that your lack of care and caution would be your finish. We hold you to a considerable degree responsible for this calamity. It is possible that your inexcusably lax handling of the prisoner Thorn was what permitted word of our invasion to slip through to the enemy. We have decided to eliminate you." He paused, then added, a little haltingly, "Before sentence is carried out, however, do you have anything to say in extenuation of your actions?"

Clawly almost laughed. He knew this scene—from myth. The Dawn Gods blaming Loki for their failures, trying to frighten him—in hopes that he would think up a way to get them out of their predicament. The Servants were bluffing. They weren't even looking for a scapegoat. They were looking for help.

This was *his* world, he realized. The dangerous, treacherous world of which he had always dreamed. The world for which his character had been shaped. The world in which he could play the traitor's role as secret ally of the Recalcitrants in the Servants' camp, and prevent or wreck future invasions of World I. The world in which his fingers could twitch the cords of destiny.

Confidently, a gargoyle's smile upon his lips, he stepped forward to answer the Servants.

Briefly Thorn lingered in the extra-cosmic dark, before his tripled personality and consciousness should again be split. He knew that the True Owners of the Probability Engine had granted him this respite in order that he would be able to hit upon the best solution of his problem. And he had found that solution.

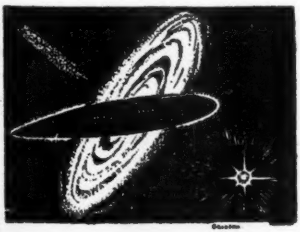
Henceforward, the three Thorns would exchange bodies at intervals, thus distributing the fortunes and misfortunes of their lives. It was the strangest of existences to look forward to—for each, a week of the freedoms and pleasures of World I, a week of the tyrannies and hates of World II, a week of the hardships and dangers of World III.

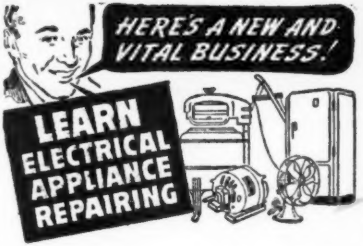
Difficulties might arise. Now, being one, the Thorns agreed. Separate, they might rebel and try to hog good fortune. But each of them would have the memory of this moment and its pledge.

The strangest of existences, he thought again, hazily, as he felt his mind beginning to dissolve, felt a three-way tug. But was it really stranger than any life? One week in heaven—one week in hell—one week in a frosty ghost-world—

And in seven different worlds of shockingly different cultures, seven men clad in the awkward and antique garments of the Late Middle Dawn Civilization, began to look around, in horror and dismay, at the consequences of their creations.

THE END.

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IN TIMES TO COME

Murray Leinster pointed out to me the other day that humans have encountered extraterrestrials by (a) humans going to E-T planets, and by (b) E-T's coming to Earth. Sometimes they've fought, sometimes established amicable relations, and, sometimes, determined to ignore each other, or found that for one reason or another they had to do so. (As when the E-T turns out to be also C.T.)

But there's one form of meeting that involves some lovely problems. Suppose that a ship from Earth, cruising deep in interstellar space, encounters another ship—but one not from Earth. The aliens must have a high civilization to have interstellar ships; then if they're friendly, contact is immensely valuable. But if they're vicious, contact is immensely dangerous. The same thoughts will, presumably, be coursing through the mind of the alien commander. Thus, neither will want to destroy the other, each will want very much to know the home planet of the other, but neither will dare reveal his own point of origin. *Neither will dare to go home!* Why? Because neither can *know* that the other hasn't some form of locator device capable of trailing a fleeing ship to its home world! So—what can the skipper do?

I think Leinster has a rather startlingly neat solution in "First Contact," next month's lead-off yarn.

THE EDITOR.

THE ANALYTICAL LABORATORY

Cramped for space, and with two months' Labs to report, I will give results sans comments:

DECEMBER, 1944 ASTOUNDING

Place	Story	Author	Points
1.	Nomad—Part I	Wesley Long	1.51
2.	No Woman Born	C. L. Moore	2.22
3.	Firing Line	George O. Smith	2.38
4.	Tricky Tonnage	Malcolm Jameson	3.23

There were only four regular fiction items in the December issue, but the final Probability Zero, our slightly-irregular fiction department, yields first prize to "Applesauce," by George W. Hall, second to "Agricultural Geology," by George Holman, and a decision that it was good, third-rate "Hot Air" that Francis W. Powell discussed.

JANUARY 1945

Place	Story	Author	Points
1.	Nomad—Part II	Wesley Long	1.90
2.	The Mixed Men	A. E. van Vogt	2.13
3.	The Waveries	Frederic Brown	2.69
4.	The Canal Builders	Robert Abernathy	3.06
5.	Enter The Professor	E. Mayne Hull	3.66

Plus a scattering of votes for George O. Smith's vacuum-maker's special for a Probability Zero prize. Sorry. No PeeZee, so G.O.S. can't run in that race.

THE EDITOR.

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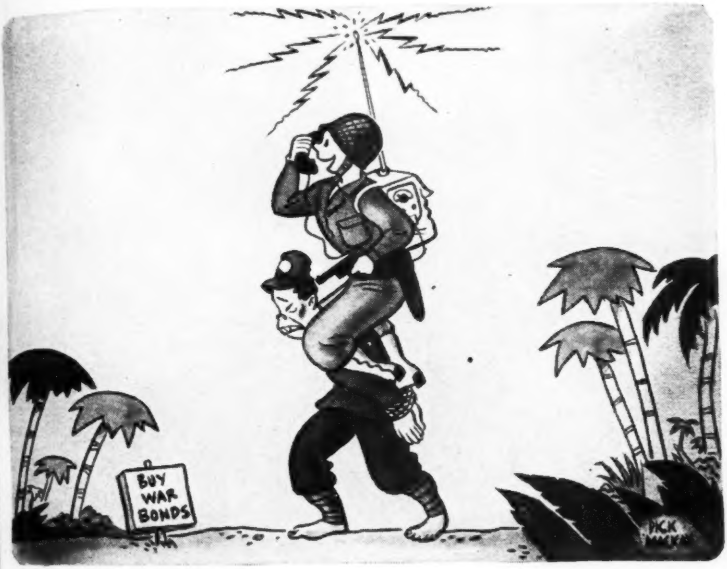
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